APRIL 1960

Utility engineering section begins on page 53

# Electrical South

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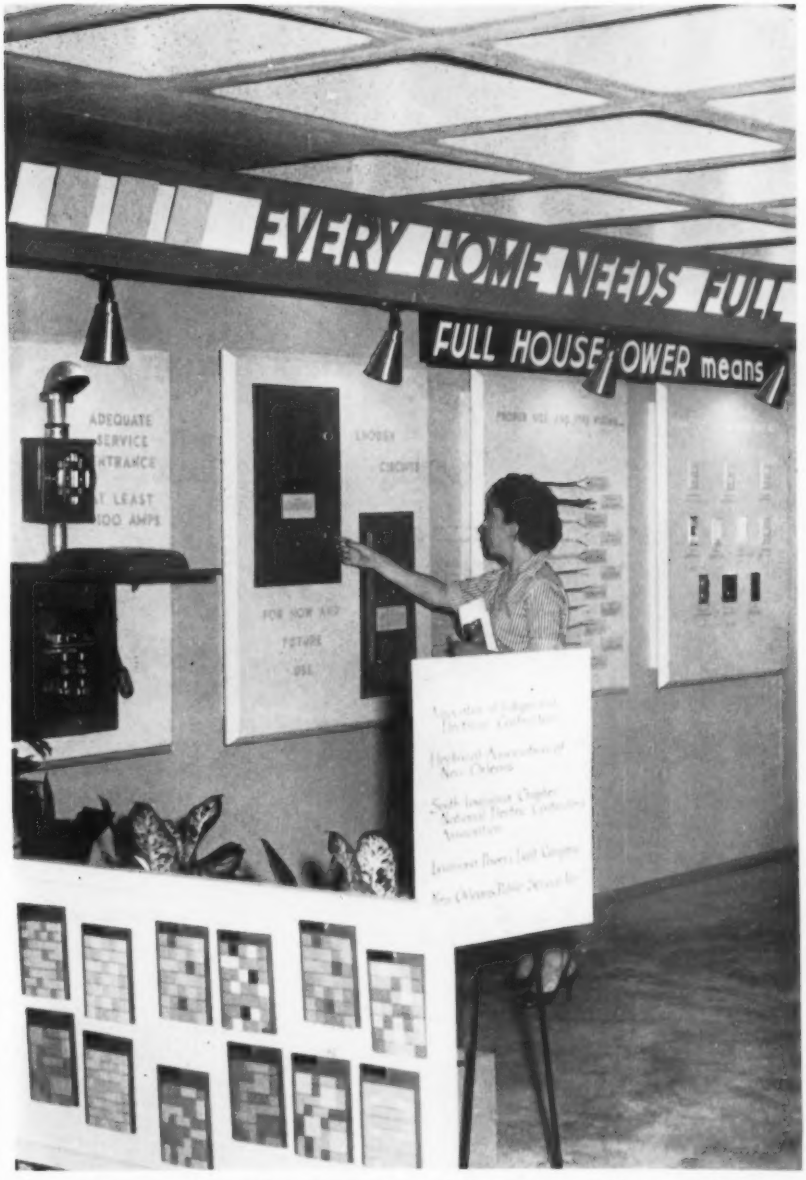


Annual roundup of adequate wiring promotion activities.

See page 22

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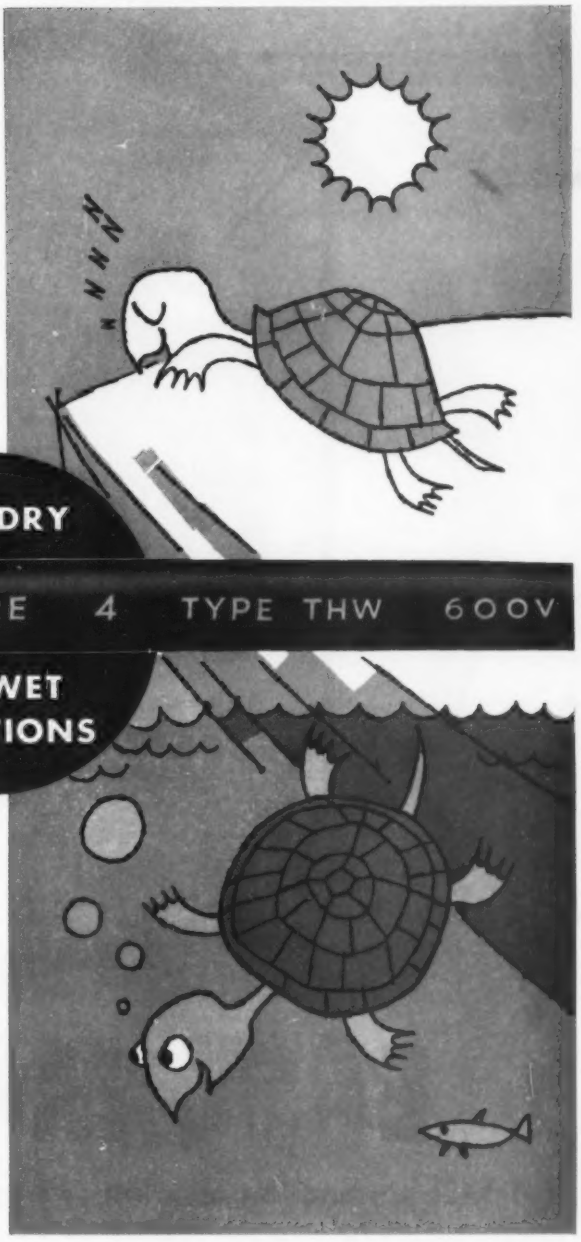

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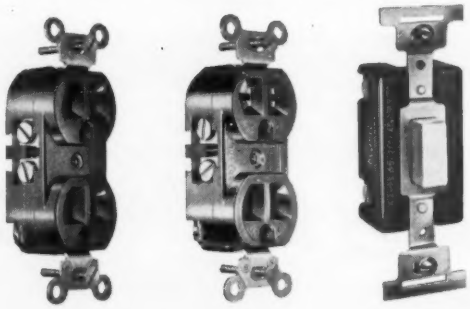

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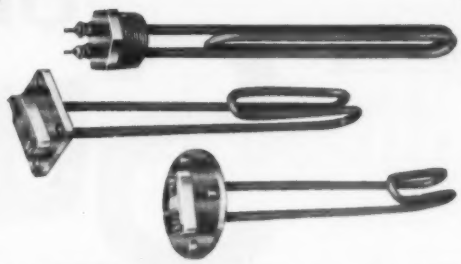

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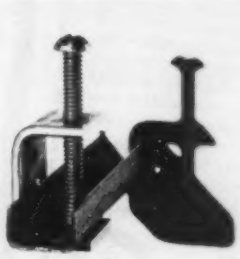

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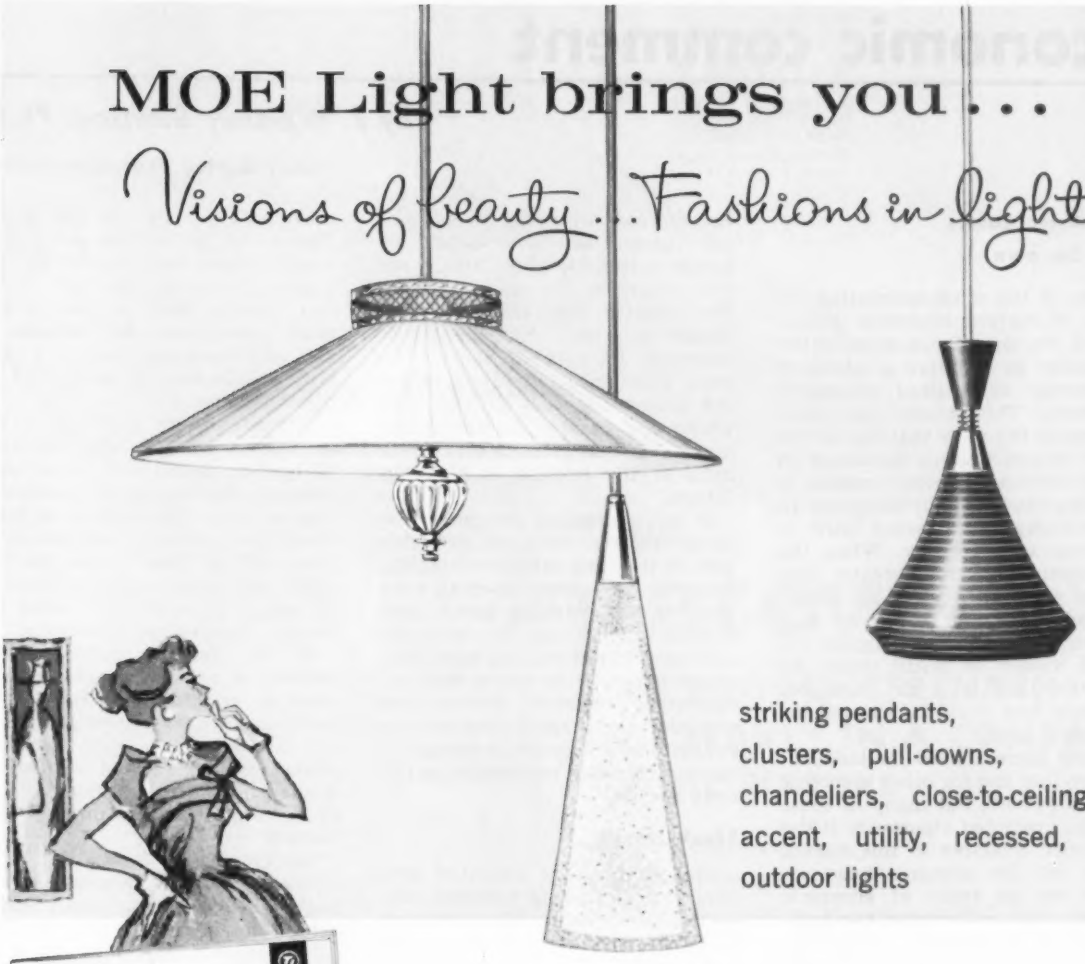

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# Economic comment

**by J. Whitney Bunting, Ph.D.**

**Contributing Economics Editor**

### Consumer comes into his own

One of the most interesting aspects of current economic discussion is the importance given to the consumer as a pillar of strength in current and future prosperity estimates. This column has often presented the view that one of the most valuable assets contained in the American economic system is the importance of the consumer in maintaining the forward pace of business and industry. When the consumer demands a greater supply of goods to increase his standard of living and backs up that demand with a willingness to spend money or credit which he controls, then it is the strongest pressure that could be exerted for economic good.

Truly there is need for industrial spending and for other economic factors as well, but many of these will be promoted vigorously if the consumer is active in the market place. At the moment, however, there are all types of economic experts who are singing the praises of "king customer" and showing by factual research his strength in the market now and in the future.

The year just passed was indicative of the huge buying interest of consumers throughout the United States. The latest figures released by the United States Department of Commerce showed that consumer buying in 1959 reached unprecedented heights, soaring to a record total of over $311 billion. Compare this figure with that of 1958 and there is a gain of 6 ½ per cent. To make the comparison more astounding and significant, in 1938 the total consumer outlay was only $64 billion.

Thus, over an uninterrupted period of twenty-one years, the public's spending for consumer items increased each year over the amount for the preceding year. And the end is not yet in sight according to recent research reports. There is every reason to believe and foresee that when the total amount of consumer spending is evaluated for 1960, the figure will have topped $400 billion.

It is true, of course, that some of the increase over the twenty-one year period has been caused by higher prices. However, this is not the answer to the huge upsurge. The figures for 1959 spending clearly indicated that the public exceeded its rate of income by some $400 million thereby reducing savings by this amount. The whole picture of consumer spending is one that reflects confidence both in the present and in the future.

It is interesting to note that these figures become available just at the time when economists, many of them governmental, have been quietly backing away from previous optimistic forecasts for 1960 and the future, and have been suggesting stability rather than accelerating prosperity. Perhaps the new data will cause another re-evaluation of economic things-to-come with more confidence in the next decade.

### Stock trends

This column has indicated previously that the big problem connected with a rapidly growing number of stock owners is that many, with little real knowledge of investing, can easily range from panic to intense optimism in their thinking. This is a dangerous situation and one that investment specialists view with alarm.

In recent years, a great number of new shareowners have come from the ranks of the middle or low income groups. Often they have entered the stock market through the purchase of shares in the companies by which they are employed. In other cases, they have entered with a view toward building up an investment program, ostensibly of a long term nature, that will increase in size along with the current inflationary picture. Most have a rather dim view of both their purpose and the financial factors involved This in itself is not bad and is not a potential problem.

The danger comes from the current movement of stock prices and the impact of such fluctuations upon the actions of the new investors. When one enters the investment field it is necessary to anticipate some degree of price movement — both up and down. Persons in the income group previously described should be investing primarily for the "long-run" rather than for day-to-day price movements. But because of lack of knowledge there is a general predilection to be fearful of price declines.

Although there is always a risk in investment, a careful selection of quality issues will invariably minimize the danger of a complete loss of value. The holding of good investments over a long period of time will in most cases provide safety and a good return. There is no reason to panic when faced by normal market readjustments.

In the present market with periods of rise and then decline, there is relatively little for the investor to fear. Price readjustments are normal, and when security prices rise out of line with dividends and earnings, there is apt to be a general softening of the market.

All indications now point to a continued rise in earnings and a probable increase in many dividend rates in 1960. In all probability, however, this will not produce a rapidly accelerating stock price boom, for this year at least. Nor will it allow the market to decline to any great extent.

Investors therefore should adopt a carefully planned program for stock purchases, relying on sound issues and having no worries about temporary price fluctuations in the next twelve-month period.

One of the soundest techniques available to evaluate stock market trends, and the long-range implications thereof, is to observe the true professional investors who manage or administer such programs as investment trusts, mutual funds, pension trusts and the like. Their strength in stopping the decline of a falling market through purchases of securities (or the reverse action in a time of spiraling prices) makes them important factors in stock market operations. Their confidence in the investment mechanism is a source of strength in the current market.

---

**Dr. Bunting is a well-known economist and educator having special knowledge of the South.**

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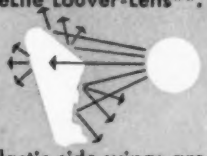

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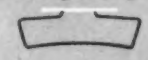

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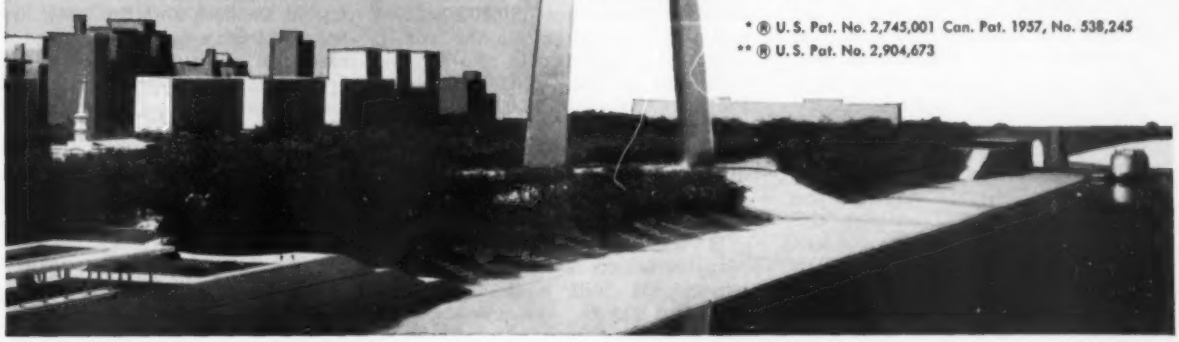

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# Washington report

**By Jack James**

**Digest of Washington news of special interest to the electrical industry**

### Charlotte electrical contractor honored

RALPH K. ROBINSON of Robinson Electric Co., Charlotte, N. C., was one of 62 men from 43 cities across the U. S. cited for "outstanding contributions to the construction industry and to the advancement of the free enterprise system" at the National Construction Industry Conference at Washington. The Conference was sponsored by the Chamber of Commerce of the United States to study the challenges of the 1960's.

### Labor Board upholds FP&L seniority clause

A THREE-MAN PANEL of the National Labor Relations Board approved a clause in the contract of Florida Power and Light Company that allowed either the company or the IBEW local to veto transfer of seniority when an employee transferred from one department to another.

The controversial clause in the contract reads in part: "Transfers may be made without loss of seniority between departments . . . by mutual consent between the Company and the particular Local Union involved."

Florida Power and the IBEW said that the clause meant: "In case of any employee transferring from one department to another, the language . . . means his seniority would not be transferred if any one Local Union voted to disapprove such transfer of seniority. This language also gives the Company the right to disapprove any such transfer of seniority."

In arguing that this clause was illegal, the General Counsel of the Labor Board pointed out that "the requirements of Union consent before seniority can be transferred creates a situation where one or more Unions by the use of their veto power can ultimately determine whether such transfer can be made." (Eleven IBEW local unions were covered by the contract.)

The Labor Board members, however, were persuaded by the company and IBEW argument that: "in the utility business, departmental seniority, as provided in the contract, is the fairest method, because entirely different qualifications are required in different departments. Therefore, if an employee leaves his job in one department for another, he becomes, in effect, a new employee for seniority purposes. . . . the sphere within which the Unions may use their power is a narrow one; their power is not to compel but only to forbid and then only to forbid a deviation from the normal which is departmental seniority."

### Many more journeymen seen needed for Sixties

FORESEEING a 60 per cent increase in business for electrical contractors in the next decade, the Department of Labor predicts that 112,000 more journeymen electricians will be needed in the 1960's.

Through apprenticeship programs the industry is training 36 per cent of the number needed, the Department comments.

According to the Department's statistics there are 130,000 journeymen electricians in the construction industry in the U. S. right now. Of these 130,000, during the next ten years 30,000 will retire or die and 2,000 will shift to other occupations. Just to do about as much work as it does now, the industry will have to train 32,000 new electricians.

If the electrical construction industry booms as the Department expects, it will have to train another 80,000 journeymen to meet new demand.

That means that the industry will need 32,000 replacements and 80,000 more additional journeymen: a total of 112,000.

Assuming continuation of present apprenticeship training levels, the industry will train 39,770 apprentices. There would be a shortage of 72,230 journeymen electricians.

This comparison is actually the best that can be made in the construction trades. Masons are training only 22 per cent of the apprentices they need; carpenters, 6 per cent; painters, 3 per cent; plumbers 17 per cent, etc. Despite the fact that electrical contractors are training apprentices at a rate that will give them only 36 per cent of the journeymen they will need in the 1960's, they are doing the outstanding job in the construction industry!

### Job opportunities in power industry analyzed

THE ELECTRIC light and power industry will probably double output during the next decade, the Department of Labor states, but won't increase employment greatly.

The Department says that private electric companies employ 260,000 people; private electric and gas companies employ 119,000 in electrical work alone; and federal, state, and municipal electric utility systems employ 65,000: a total of 444,000.

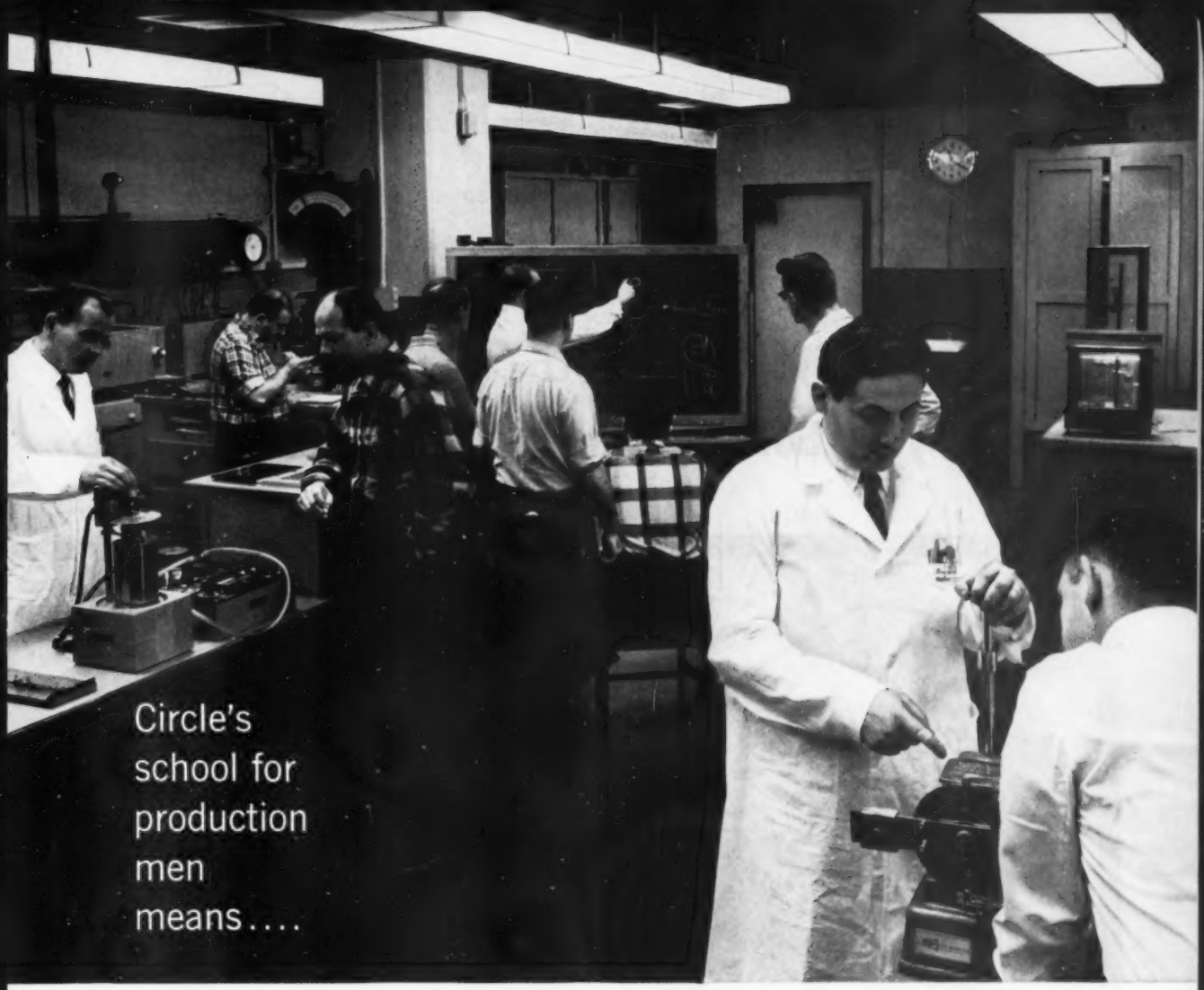
Altogether these employees work at 3,500 different electric systems serving almost 25,000 communities.

Predicting a doubling in electrical output in the 1960's, the department reports:

"In 1957, industrial plants purchased more than half the power sold by utility companies. The use of electricity has become essential in industrial operations. . . . Considering both the favorable long-term economic outlook for industry in general and the new uses for electricity in industrial processes, a sustained long-run increase in the proportion of electricity consumed by industry may be expected.

"Residential customers purchased over a quarter of the electric power from utility companies in 1957. Total demands by households for electricity will increase substantially during the 1960-70 decade because of the increasing

*(Continued on page 135)*




## BETTER WIRE AND CABLE FOR YOU

It isn't enough to build cable quality in the laboratory. There has to be follow-through in production.

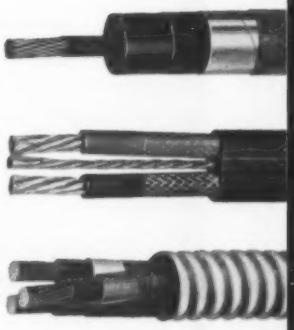
And that calls for production men who not only care enough but *know enough* to consistently turn out top quality products.

That's why Circle production men "go to school." Periodically they attend lectures given by skilled laboratory technicians. They review such subjects as extrusion techniques, proper operating speeds, production line testing procedures, etc.

In-plant training such as this is unusual for wire and cable men. It is one of many reasons, however, why Circle products have achieved a reputation for high quality.

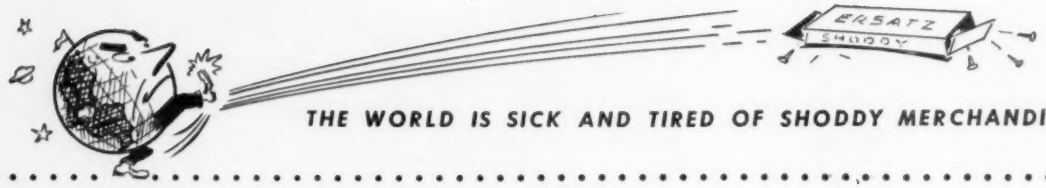
Next time you buy or specify cable, ask for Circle . . . there's no finer cable made.

*Trade Mark



CIRCLE WIRE & CABLE
*a subsidiary of*
CERRO DE PASCO CORPORATION

RUBBER COVERED WIRE & CABLE • VARNISHED CAMBRIC CABLE • PLASTIC INSULATED CABLE • NEOPRENE SHEATHED CABLE • CIRTUBE* EMT

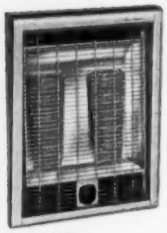



THE WORLD IS SICK AND TIRED OF SHODDY MERCHANDISE

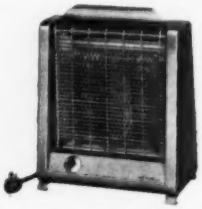
# happy, satisfied customers

## boost your business more than anything else

CAVALIER
ELECTRIC BASEBOARD
115 V. Duplex Outlets
Built-in Thermostat
End Caps • Corner Piece

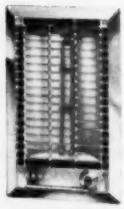


CAVALIER
WALL INSERT
1 to 5 KW



CAVALIER PORTABLE
2, 3, 4 KW

CAVALIER
CABLE
HEAT



CAVALIER BATHROOM
Automatic and
non-automatic
120 and 240 volt

## Cavalier...
### your assurance of Highest Quality

**CAVALIER** heating equipment has the genuine quality that sells, pleases customers and eliminates costly service calls.

**CAVALIER** has a complete line, and backs its products with written guarantees.

**CAVALIER** heating equipment is soundly engineered, thoroughly tested and built for long life. Although repair parts are rarely needed, they are promptly available at reasonable cost.

**CAVALIER** keeps within efficient trade channels, and works to assure business-like profits for distributor and contractor.

**CAVALIER** is nationally advertised and backs its highest quality products with complete sales and merchandising helps which are available on request.

ELECTRIC HEATING DIVISION **CAVALIER CORPORATION** CHATTANOOGA 2, TENNESSEE

*OVER 90 YEARS OF QUALITY PRODUCTS*

**FIRST** *in quality construction*
*in engineering advances*
*in safety*
*in sales making features*

# FREE—$50 IN REMCON DEVICES!

Builders, architects, homeowners—today *everyone* is looking for the little touches of luxury that make a home more desirable, more saleable. Low-voltage switching is just the "extra" that can help you provide *your customers* with comfort and convenience through electricity. And now with REMCON, the low-voltage system that's practical in any home regardless of cost, you can do it at a profit!

## WHAT IS LOW-VOLTAGE SWITCHING?

Low-voltage switching is the greatest advance in light control since the pull chain. By eliminating the need for elaborate, costly wiring, it provides the ultimate in versatility and safety through multi-point, master-control and path-of-light switching. Low voltage switching also ends shock hazard by putting only 6 volts at the switch.

## 4 REASONS WHY REMCON IS EASIER TO INSTALL

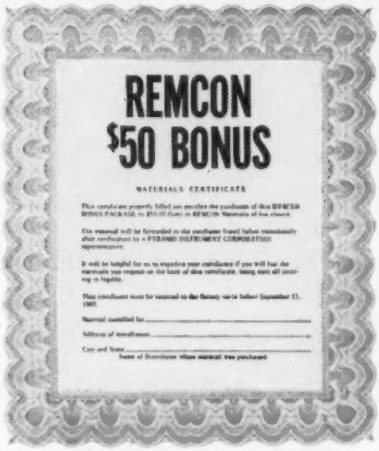
REMCON builds the transformer *right into the relay* to make low-voltage switching easier four ways: 1. No separate low-voltage source (eliminates additional wiring); 2. No complicated systems. With REMCON, installation is as simple as connecting the three wires of the relay to the three color-coded wires of the switch; 3. No more need to run heavy armored cable from fixture to switch; in fact...4. No more switch box! Any way you look at it, there's no longer any reason to shy away from modern low-voltage wiring—especially when you think of the time, labor and money it saves!

## THOUSANDS OF DELIGHTED USERS

Contractors everywhere are delighted with REMCON'S flexibility, whether they wire tract or custom homes. Read these:

"Remcon helps me provide luxury at a profit even in a $15,000 home. I can build in three- and four-way switching quickly—*at lower labor costs*—because Remcon's #18 wire *staples* to studs. I'm sold, and my tracts go just as fast." *Sidney Gotowner, Gotowner Electric.*

"Even in a custom home, small details like Remcon's pilot-light switches and hi-fashion switch plates are appreciated. Remcon plates, for example, blend with and enhance any room's decor. They're practical in *any* home." *Ephraim Berkowitz, Turnpike Electric.*




## REMCON—THE ANSWER TO CUTTHROAT COMPETITION

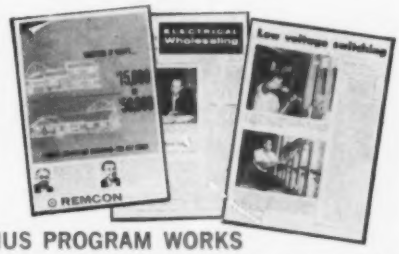
**The need for contractors to "trade up" their customers is so important today that the National Electrical Contractors' Association made it the prime topic of discussion at their recent convention. How do *you* break out of the vicious circle of low bids, cheap services, poor or no profits? By offering the "plus" that pulls you away from the pack...REMCON!**

## NOW ACTUALLY COSTS LESS!

Before this $50 Bonus Program, the ease of installing REMCON was more than enough to offset the slight expense over outmoded, conventional wiring. But even that's been changed. Now REMCON gives you a Certificate worth $50 in the REMCON devices of your choice—just for trying REMCON on your next job.

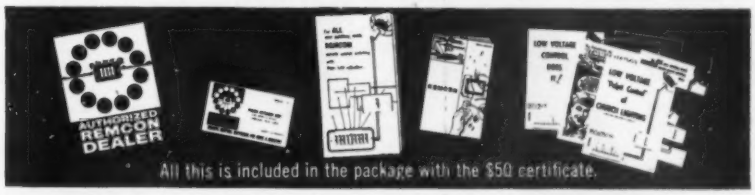
## REMCON SUPPORTS YOUR SELLING EFFORTS

To make it still easier for you to sell, REMCON is now in the midst of an extensive advertising and promotion campaign which includes full-page colorful ads, direct mailings to builders and architects, and an intensive publicity effort that has paid dividends in a steady barrage of articles in leading newspapers and magazines.




## HOW THE $50 BONUS PROGRAM WORKS

Go to your distributor. Buy your first package of REMCON materials (it's enough to wire the average three-bedroom house). This package will also contain: 1. A *Materials Certificate* worth $50 (list) in the REMCON materials of your choice; 2. A request form for obtaining free business cards imprinted with your name; 3. Free envelope stuffers for you to distribute to your customers; 4. Free truck decals; 5. Complete REMCON literature, including an Electrician's Manual, an illustrated instruction manual, easy-to-follow installation data sheets and wiring diagrams, and articles describing typical industrial and residential REMCON installations. You also get all new information as soon as it's issued. In addition, you will automatically be listed as an *Authorized* REMCON *Dealer*, which entitles you to our free Consultation Service—you send us your prints and we'll send back a REMCON switch layout and a list of the materials needed to do the job. The $50 Bonus Program is now in effect. Go to your distributor today!




**REMCON** A Division of Pyramid Instrument Corp., 630 Merrick Road, Lynbrook, N. Y., Dept. ES-40

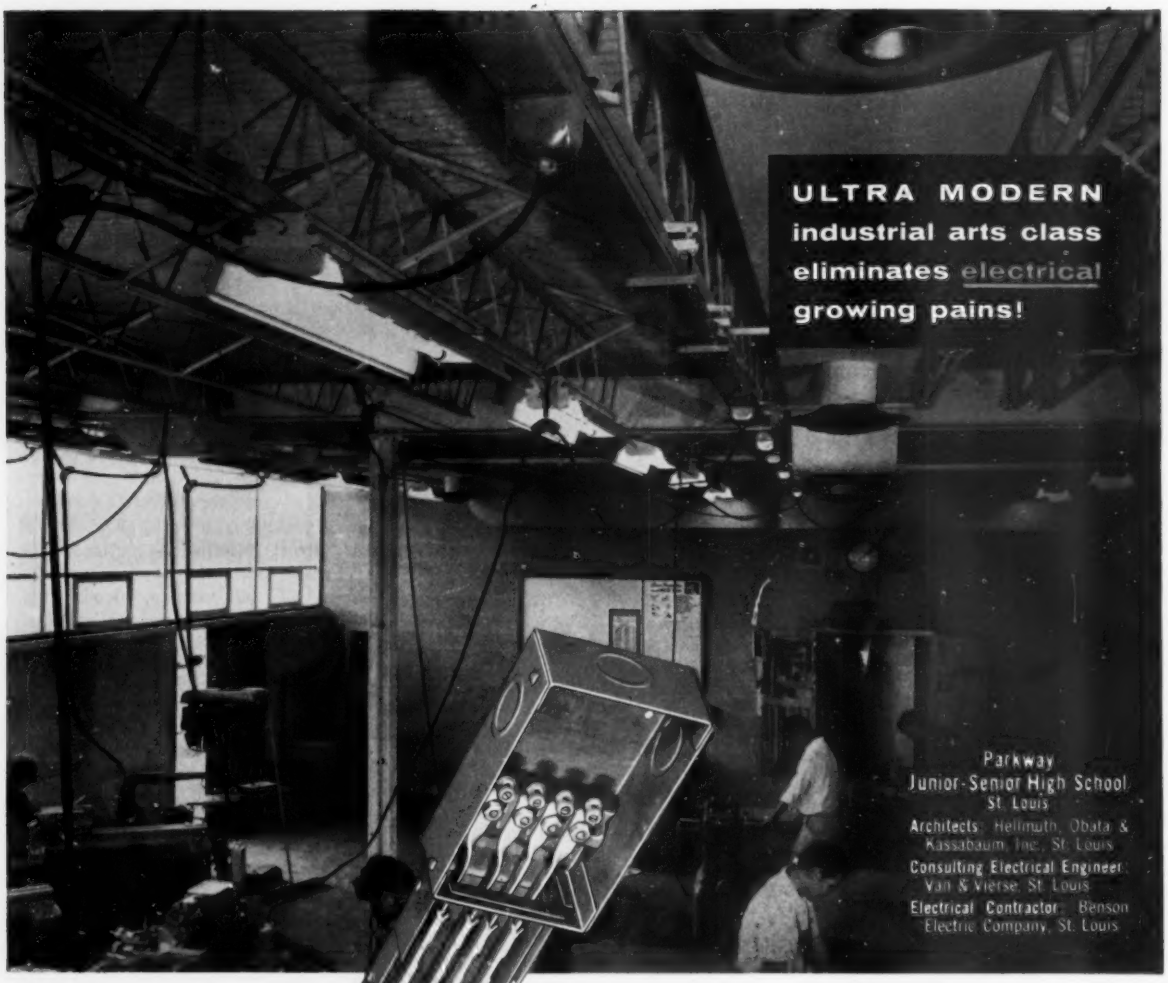
Okay REMCON, sign me up as an Authorized REMCON Dealer, send me your *free Information Kit* and the name of my local REMCON Distributor. I understand I am under no obligation.

Name_____

Address_____

City_____ Zone_____ State_____

MAIL NOW




# FRANK ADAM MIDGET POWERPLUGIN BUSDUCT

**Hangers**—One for each 5 ft. of busduct. For ceiling or side wall installations.

**Plugin Device**—Two spring prongs attached to device, catch and lock on the inside of duct to form a rigid support. Also act as ground connection to duct.

**Plugin Outlets on 12" Centers**—Provide electric power where it's needed, when it's needed. 100 amps., 250 volts or less.

A perfect example of how Frank Adam Midget Powerplugin Busduct keeps pace with the future!

Present classroom equipment can be moved and plugged-in almost as easily as an electrical appliance . . . the busduct quickly relocated if necessary. If additional busduct is needed for future expansion, it can simply be added to the old! Cuts costly rewiring—keeps electrical downtime to a minimum.

For an economical and versatile electrical power supply that will stay modern for years to come, specify and insist on quality built Frank Adam Midget Powerplugin Busduct.

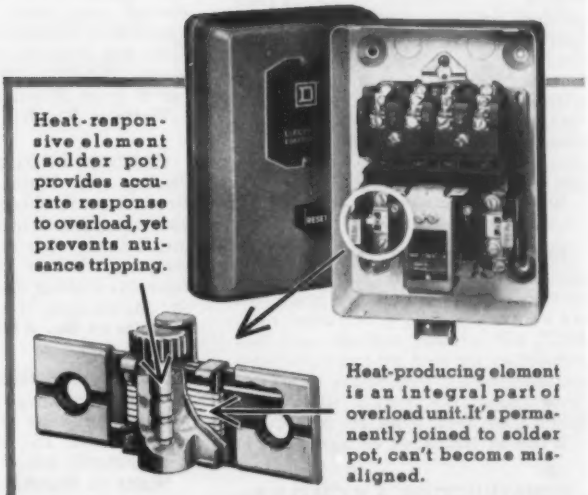
**FRANK ADAM ELECTRIC COMPANY**
P. O. BOX 357, MAIN P. O. · ST. LOUIS 66, MO.

*busduct • panelboards • switchboards • service equipment • safety switches • load centers • Quikheter*

# ONLY SQUARE D STARTERS WITH ONE-PIECE OVERLOAD RELAYS GIVE ABSOLUTE PROTECTION!

• Only Square D makes thermal overload relays with 1-piece construction—and only with 1-piece construction can you *know* you've installed the heater correctly. Square D 1-piece overload relays can be installed only one way. They are factory-assembled, individually tested and calibrated, completely tamper-proof. Repeated tripping will not affect accuracy.

You *pay* for overload protection—be sure you *get* it. Insist on Square D 1-piece overload relays for *absolute* protection.


Heat-responsive element (solder pot) provides accurate response to overload, yet prevents nuisance tripping.
Heat-producing element is an integral part of overload unit. It's permanently joined to solder pot, can't become misaligned.

**D EXCLUSIVE—** 1-piece Overload Relay for *ABSOLUTE* Protection!

***Mail coupon today for simple "jig-saw" demonstrator —see why only Square D gives absolute protection***

**Square D Company**
**Department SA-227**
**4041 North Richards Street**
**Milwaukee 12, Wisconsin**

Please send me information on Square D magnetic starters, along with your simple 3-minute "jig-saw" demonstrator

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

**SQUARE D COMPANY**

***wherever electricity is distributed and controlled***

# CATALOGS and BULLETINS

## Available Free to Readers of Electrical South upon Request

**FITTINGS AND FIXTURES**—Information relative to explosion-proof fittings, fixtures, plugs and receptacles, and accessories is available in a 50-page book illustrating the complete line of these products manufactured by Killark Electric Mfg. Co., Easton and Vandeventer Ave., St. Louis 13, Mo.

**Write in No. A101 on card, Pg. 17**

**ELECTRICAL BOXES**—Steel City Electric Co., 1207 Columbus Ave., Pittsburgh 33, Pa., offers a catalog of their complete line.

**Write in No. A102 on card, Pg. 17**

**STEEL WIRE**—Technical information on Alumoweld, a newly developed aluminum-covered steel wire and strand, is contained in a 12-page catalog, just issued by the Wire and Cable Division of Copperweld Steel Co., 322 Frick Building Pittsburgh 19, Pa. Illustrated and documented with engineering data, the colorful catalog provides a complete working knowledge of this new material—its properties, advantages, applications and construction practices.

**Write in No. A103 on card, Pg. 17**

**ELECTRICAL FITTINGS** — A 40-page illustrated catalog and price list on the Gedney line. Shown and listed are conduit, threaded entrance, SEC, EMT and ground fittings and box connectors for both armored and non-metallic cables. Copies are available from Gedney Electric Co., RKO Bldg., Radio City, New York 20, N. Y.

**Write in No. A104 on card, Pg. 17**

**CONSTRUCTION ANCHORS**—"Anchoring for Power and Communications Lines," a completely illustrated manual on improving line construction with better anchoring, has been published by the Advertising Dept., the A. B. Chance Co., Centralia, Mo. The 25-page booklet shows how to install the right anchor at the right place in the right way.

**Write in No. A105 on card, Pg. 17**

**SERVICE PANELS** — Information on protective electric control centers for homes, apartment buildings, service stations, and industrial applications is contained in Bulletin PM-385, "BullDog Pushmatic Electric-Centers," issued by BullDog Electric Products Co., 7610 Jos Campau, Detroit, Mich.

**Write in No. A106 on card, Pg. 17**

**ELECTRICAL FITTINGS**—Blackhawk Industries, Dubuque, Iowa, offers a complete catalog of electrical conduit and cable fittings. Also a special publication giving detail drawings and instructions for installing service entrance masts on low or ranch type buildings.

**Write in No. A107 on card, Pg. 17**

**WIRE PULLING LUBRICANT** — Illustrated six-page folder showing the advantages of an improved Y-Er Eas wire pulling lubricant is available from Electro Compound Co., 4145 W. 150 St., Cleveland 11, Ohio.

**Write in No. A108 on card, Pg. 17**

**GENERAL CATALOG** — General catalog of Royal Electric Corporation, Pawtucket, R. I. covering flexible, service and lamp cords, cord sets, extensions, trouble lights, wiring devices and fuses is available to wholesalers. Dealers catalogs may be secured from Royal distributors.

**Write in No. A109 on card, Pg. 17**

**CARBON PRODUCTS**—A 28-page catalog on Motor and Generator Brushes and carbon products telling how to order brushes, grade recommendations, characteristics, and description of brush grades, is available from the Helwig Co., 2536 North 30th St., Milwaukee, Wis.

**Write in No. A110 on card, Pg. 17**

**POWER BENDER** — The lightweight hydraulic power bender #884, manufactured by Greenlee Tool Co., of Rockford, Ill., is described in a new bulletin issued by the company.

**Write in No. A111 on card, Pg. 17**

**ELECTRICAL EQUIPMENT**—The Wadsworth Electric Mfg. Co., Inc., Covington, Ky., has issued a new catalog 58' Guide, containing data on their line of Safety Switches, Service Equipment, Distribution Panels, "E-Z-RED" Circuit Breakers, interchangeable and non-interchangeable, also wiring troughs.

**Write in No. A113 on card, Pg. 17**

**COMPRESSION CONNECTORS** — New and fully illustrated Bulletin 13 offered by the James R. Kearney Corp., 4236 Clayton Ave., St. Louis 10, Mo., shows their complete line of Squeezon compression fittings. They make all overhead distribution connections from line wire to ground rod on aluminum, ACSR, copper, or combinations of them. Application and installation data are given for tap connectors of several types; service entrance, splicing, jumper and repair sleeves; terminals, stirrups and ground fittings. Mechanical and hydraulic installing tools for both dead and hot line work are listed.

**Write in No. A114 on card, Pg. 17**

**SELECTING FUSES** — A 12-page descriptive handbook "Fuseology tells how to get safest most dependable, trouble-free electrical protection from fuses. Contains useful information on selecting right size and type of fuses —how to stop needless blows—avoiding poor contact and other troubles. Issued by Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo.

**Write in No. A115 on card, Pg. 17**

**LIGHTING FIXTURE DATA**—The Perfeclite Co., 1457 East 40th Street, Cleveland 3, Ohio, makes available the following literature: (1) Data Folder 54-B—4 pages of engineering information, prices and specifications on Plastic Indirect Concentric Ring Luminaires. (2) Data Folder EX-57—10 pages of information on Exit Units for all building locations. Complete Engineering data and prices given. (3) Data Folder 56-A—Information on Ceiling Pan Fixtures and Vapor Proof Prismatic Exterior Fixtures. (4) Data Folder 58-A on Concrete Mounting Boxes for recessed incandescent units. (5) Data Folder 58-B on Fluorescent Exit Units. (6) Data Folder 58-C on Phosphorescent Exit Units. (7) Data Folder 57-A on extra shallow recessed units and square ceiling pans. (8) Catalog 956—60 pages plus 12-page supplement, complete with descriptions and engineering information. (9) Data Sheet 57-D—a two-page description of square ceiling pan units and exterior conduit mounted-pan-type units.

**Write in No. A117 on card, Pg. 17**

**ELECTRICAL FITTINGS**—Concise 36-page catalog illustrates and describes a complete line of electrical fittings, cable racks and wiring specialties. The catalog contains many detail drawings, clear-cut photographic illustrations of mast fittings, cable connectors, traps, hangers and ground clamps in a wide variety of types and sizes. For your free copy, write The M. & W. Electric Mfg. Co., East Palestine, Ohio.

**Write in No. A120 on card, Pg. 17**

# INFORMATION CENTER

BOOKLETS • NEW PRODUCTS • ADVERTISEMENTS

## Help yourself to free literature and more details on any product mentioned in this issue.

Instead of writing a dozen different manufacturers for free literature and more information on products, tools, or services, just insert on the cards below the appropriate key numbers of the items in which you are interested. These cards may be used to get information on products mentioned in the following departments (see Contents Page for page number):

Catalogs and Bulletins — New Electrical Products
New Utility Equipment — Manufacturers' Literature

Be sure to print or write legibly your name and address—drop it in the nearest mail box and

## ES pays the postage!

APRIL, 1960

Send free information on these NEW PRODUCTS and/or services (fill in key numbers):

_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____

Send this FREE LITERATURE (fill in key numbers):

_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____

Send free information on these ADVERTISEMENTS:

Company _____ Page ____ Company _____ Page ____
Company _____ Page ____ Company _____ Page ____

My Name _____ Position _____
My Company's Name _____
Address (number and street) _____
City _____ Zone ____ State ____

APRIL, 1960

Send free information on these NEW PRODUCTS and/or services (fill in key numbers):

_____ _____ _____ _____ _____ _____
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Send this FREE LITERATURE (fill in key numbers):

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_____ _____ _____ _____ _____ _____

Send free information on these ADVERTISEMENTS:

Company _____ Page ____ Company _____ Page ____
Company _____ Page ____ Company _____ Page ____

My Name _____ Position _____
My Company's Name _____
Address (number and street) _____
City _____ Zone ____ State ____

# These cards can help you get valuable information

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 582, SEC. 34.9, P. L. & R., ATLANTA, GA.

**Electrical South**

806 PEACHTREE ST., N. E.

ATLANTA 8, GEORGIA

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 582, SEC. 34.9, P. L. & R., ATLANTA, GA.

**Electrical South**

806 PEACHTREE ST., N. E.

ATLANTA 8, GEORGIA

# CATALOGS and BULLETINS

## Available Free to Readers of Electrical South upon Request

**CABLE CONNECTORS** — Tomic Sales and Engineering Co., 20000 Sherwood Ave., Detroit 34, Mich., now have available catalog sheets containing data on the complete line of their connectors, couplings, and cable connectors.

**Write in No. A121 on card, Pg. 17**

**WIRING DEVICES** — A complete new catalog of wiring devices is now available from Bell Electric Co., 5735 S. Claremont Ave., Chicago 36, Ill. The line includes a wide range of weatherproof receptacles and switches, portable garden light, wall plates, and specialty items.

**Write in No. A122 on card, Pg. 17**

**PLUG-IN REELITE** — Complete details about Appleton's lightweight, portable automatic Reelites are given in an attractive 4-page catalog insert. These devices find application in a wide range of occupancies: garages, loading docks, garment industry, construction crews, warehouses, machine shops, etc. Write to Appleton Electric Co., 1701 Wellington Ave., Chicago 13, Ill.

**Write in No. A124 on card, Pg. 17**

**WIRING PRODUCTS** — Various features of J&S Despard interchangeable wiring devices and detailed information concerning this line are offered in a brochure released by Pass & Seymour, Inc., Dept. ES, Syracuse 9, N. Y. Included are such features as Camstrap for quick, easy installation, three-wire grounding, and pressure terminal devices.

**Write in No. A125 on card, Pg. 17**

**FLUORESCENT BALLASTS**—Advance Transformer Co., 2950 N. Western Ave., Chicago 18, Ill., has recently completed the compilation and printing of a 20-page catalog on fluorescent ballasts and their use. Included are data sheets on available advance ballasts and a comprehensive installation and operation section and testing procedures. Copies of the booklet are available on request.

**Write in No. A126 on card, Pg. 17**

**GUTH INDUSTRIAL LIGHTING BROCHURE** — New 8 page, 4 color brochure by The Edwin F. Guth Company, 2615 Washington Blvd., St., Louis 3, Missouri, describes Guth KOLORKODED industrial lighting fixtures. This unique innovation of color coding luminaires opens a new field in industrial lighting. Folder includes photographs, lighting data, engineering information and complete descriptive data on KOLORKODED luminaires and standard RLM reflector units. Write for your free copy.

**Write in No. A127 on card, Pg. 17**

**WIRING DEVICES** — Catalog No. 56, and New Product Bulletins, containing the complete electrical wiring device line of Leviton Mfg. Co., Inc. Brooklyn 22, N. Y. Over 100-pages accurately illustrated and containing electrical and circuit wiring diagrams. Complete cross index for easy reference. Featured are Specification Grade Devices, Interchangeable line, Lev-O-Lock line, and many, many others; devices for every possible use in Industrial, Commercial and Residential applications.

**Write in No. A128 on card, Pg. 17**

**ELECTRICAL CONDUITS** — "National Electric Conduits" is the 20-page Catalog No. 603 which describes and illustrates the many types of electrical conduits manufactured by National Electric Div., H. K. Porter Co. Porter Bldg. Pittsburgh 22, Pa.

**Write in No. A129 on card, Pg. 17**

**ANCHORING DEVICES**—An illustrated 32-page catalog, No. 70, describing more than 25 anchoring and drilling devices for making fastenings to masonry, is available from the Arro Expansion Bolt Co., Marion, Ohio.

**Write in No. A131 on card, Pg. 17**

**CONNECTORS** — Comprehensive, up-to-date information on electrical connections for overhead lines in transmission and distribution is now available in one convenient publication, a 10-page manual issued by Burndy Corp., Norwalk, Conn., on connection techniques, connectors, and installation tooling.

**Write in No. A132 on card, Pg. 17**

**CONDUIT FITTINGS**—A new 24-page catalog, illustrating a complete line of conduit fittings, oval bodies type LB, LL, LR, and T, and lighting parts is now available from Elliott Electric Products Co., 1513 Olmstead Ave., New York 62, N. Y.

**Write in No. A133 on card, Pg. 17**

**ANTI-CORROSIVE PAINTS**—Subox, Inc., Fairmount Plant, Hackensack, N. J., announces the availability of literature on their lines of anti-corrosive paints and coatings, Subox paints give protection for years and largely eliminate the need for scraping and repriming when repainting.

**Write in No. A135 on card, Pg. 17**

**ELECTRICAL EQUIPMENT** — A new 12-page pictorial bulletin briefly describes manufacturing facilities and electrical products of Crouse-Hinds Co., Syracuse 1, N. Y. Emphasis is on the variety of equipment available in the four product lines: Condulet electrical equipment, floodlights, aviation lighting equipment, and traffic control.

**Write in No. A138 on card, Pg. 17**

**POWER OUTLETS**—Weatherproof utility power outlets in a wide range of capacities and designs are described in literature now available from Midwest Electric Products, Inc., Mankota, Minn. These power outlets are well suited to many outdoor applications such as temporary services, trailer parks, etc.

**Write in No. A140 on card, Pg. 17**

**COVERED CABLES**—A new 44-page brochure is now available from Southern Electrical Corp., Chattanooga, Tenn. The brochure is designed to provide the latest available data for the use of Compresto covered cables as weather-proof line wire, duplex, triplex, and quadraplex. It features helpful data on the various coverings of neoprene, polyethylene, two-coat, and the new high-density polyethylene.

**Write in No. A142 on card, Pg. 17**

**CONDUIT FITTINGS** — A new catalog describing their line of conduit fittings is now available from L. E. Mason Co., Boston 36, Mass. The illustrated, looseleaf-type folder contains information on design features, specifications, ordering, prices, and shipping.

**Write in No. A143 on card, Pg. 17**

**AERIAL CABLES** — A 32-page booklet from Southern Electrical Co., P. O. Box 989, Chattanooga, Tenn., explains how Compresto Cables and PLM Products' "Wrap Around" spacers can be combined in a compact spaced aerial cable system. Design, voltage drop, sag and tension, and short circuit current are also covered.

**Write in No. 144 on card, Pg. 17**

**WIRING DEVICES** — A complete new illustrated catalog and price book is now available from E. M. Wiegmann and Co., Inc., Freeburg, Ill., covering their line of outlet and switch boxes, cut-out and pull boxes, wireholders and racks, and service entrance equipment.

**Write in No. 145 on card, Pg. 17**

# Roundup of utility promotion

**This "Rate Your Housepower" display panel shows homeowners exactly how much wattage is required for the electrical appliances they want. Built by the Baltimore Gas and Electric Co., the panel totalizes power needed as customers select their appliances.**

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers
- Consulting Engineers ✓

## Prospects rate wiring needs with display and literature

◆ "OUR HOUSEPOWER PROGRAM continues to gain momentum and naturally we will continue the promotion throughout 1960," says H. F. Carr, manager of the Baltimore Gas and Electric Co., Baltimore, Md.

Statistics indicate that the company is making headway, as 65 per cent of all the company's service changes made in old homes were upped to 100 ampere capacity or greater. The rate was only 37 per cent in 1956, and stopped at 57 per cent in 1958.

The local code provides for a minimum of 3 wire, 60 ampere service in new homes, and in 1958, some 55 per cent of the homes were equipped with 100 ampere service or more. This figure rose to 75 per cent in 1959.

Of the 3,382 persons inquiring about Housepower, more than half later installed 100 amperes or above, at an average cost of $237. The proportion of contractor sales to the jobs sold by power company representatives is showing a steady increase in favor of the contractors. Mr. Carr believes this is due to contractor training and promotion directed towards building public confidence in the trade.

The company's Housepower Forums for contractors are conducted by the University of Baltimore, and will be repeated again this year. In addition, the company will use the new "Profit Clinic" for more advanced training. Training schools in electric heat are under way and are widely accepted by electrical contractors.

### Homeowners rate wiring

The Baltimore company has recently built an illuminated "Rate Your Housepower" display panel, equipped with colored transparencies. By pressing buttons, the customer is able to light up the tansparencies of various appliances and the wattages will add up the size of service actually needed to carry the load. This new panel, when not on display at fairs and carnivals, will tour service areas in a mobile "Carnival of Living" trailer owned by the company. This trailer has received tremendous acceptance, Mr. Carr says, and more than 52,000 adults passed through it during the last five months of 1959.

Consumer literature, contractor truck signs, job-identifying lawn signs, pocket protectors, school book covers, pencils, matches, and similar materials will be used even more extensively to promote Housepower in 1960. Television, radio, and newspaper advertising will continue to play a prominent part in the program, as will special year round window displays. For 1960, the company sponsored television news program has gone on a Monday through Friday schedule with considerable emphasis on Housepower.

Direct mail Housepower canvassing of concentrated areas was begun this year, and the first such area to which the Housepower message was carried has produced excellent results, according to Mr. Carr. In addition, plans call for "Using the Users." Bonuses will be offered for leads.

### Gold Medallion promotion

A great deal of our promotion in 1960 will be directed toward development of the "Gold Medal-

# of adequate wiring for 1960

lion Home," company officials say. To this end, contractors and the public will be made aware of the advantages of the three-fold powerhouse of electrical living: electrical heating, adequate wiring, "light for living", plus additional electrical appliances and full insulation.

Every opportunity will be sought to give wiring demonstrations and talks to schools and various groups, Mr. Carr brought out. Wherever possible, these talks will be supplimented with "light for living" presentations.

The company's financing plan, so successful in past years, will be continued, as will their own staff or wiring representatives, engaged in making surveys and direct sales, which are turned over to cooperating electrical contractors on a rotating basis. The public response to their Housepower program has been excellent, according to Mr. Carr.

The company has anticipated that their promotion of supplementary electric heating and its demand for increased wiring in the modernization market will make their Housepower position even stronger this year.

## Housepower councils useful in promoting wiring sales

◆ HOUSEPOWER Councils have been used advantageously for wiring promotion in the territory served by Kentucky Utilities, says Lynwood Schrader, director of residential sales and service. The company serves 77 counties in Kentucky, three counties in Virginia, and two counties in Tennessee. To obtain coverage of this large territory, twenty-five Housepower Councils have been organized.

These councils are composed of electricians, appliance dealers, bankers, insurance representatives, builders, and others interested in promoting adequate wiring. Each council adopted standards for certified wiring and issued certificates to those homes meeting the specifications. The councils have been most effective in developing and promoting a universal standard for wiring, Mr. Schrader says.

The councils meet regularly and many of them have created effective promotion programs. Newspaper ads and radio spots have been sponsored under the council banner. One council developed a sales contest for members selling electrical wiring. Members also help promote open houses. The councils have aided the Medallion Home program, and the Housepower standards of the councils must be met before a Medallion is issued.

### Company backs council

Kentucky Utilities Company plans to support council activities with radio spots on 40 radio stations during 1960. These spots will sell the benefits of better wiring and refer the customer to the Housepower Council for assistance in obtaining Full Housepower.

Electric house heating is now being widely accepted. Just under 200 homes in this area were heated electrically in 1959, and the number is expected to more than double in 1960. A series of twelve newspaper ads promoting heating and the Gold Medallion will be run this year.

During a three-month campaign in 1959, the company offered a wiring allowance to customers installing an electric range or dryer. If only a range circuit was required, $15 was paid to the customer for wiring. If the customer had an existing 2-wire, 120 volt service and converted to 3-wire, 100 ampere service and installed a range circuit, $35 wiring allowance was paid.

### Sales rise with promotion

The response to the promotion was outstanding, according to Mr. Schrader. Appliance dealers, distributors, and Housepower Councils tied in with the widely advertised promotion. Range and dryer sales rose, and 430 customers converted to 100 ampere service. Over 1,700 customers added circuits for the appliances. In view of the success of the 1959 promotion, similar promotions will be conducted for electric ranges, water heaters, and dryers during promotional periods in 1960.

A comprehensive, companywide load-building and development plan has been prepared for 1960. Quotas for all phases of promotion have been set. An important part of this over-all plan is certified Housepower wiring, Medallion Homes, and electric heating installations.

Plans are complete and the program is in action. The year of 1960 promises to be most successful for wiring promotion.

## Co-op ads build acceptance for adequate wiring

◆ A COOPERATIVE advertising arrangement with the Electrical League of Knoxville has been the principal source of electrical promotion for the Knoxville Utilities Board, according to Ralph D. Culvahouse, residential supervisor for the board.

Under this plan, electrical contractors, appliance distributors and dealers, as well as supply distributors and manufacturers have

bound themselves together in the Electric League of Knoxville, which carries on a planned year-round advertising campaign.

Last year, the league sponsored a cooperative advertising program in the Business Review Section of the Knoxville News-Sentinel. A series of 26 ads were run, one every other week for a total of 416 inches in all. In addition, 159 column inches of publicity space were used to promote different phases of electrical living, with all copy and ads featuring "adequate wiring." Each electrical contractor was listed 20 times in the ads.

The Electric League was also one of the sponsors for the "Gold Medallion Home" program in Knoxville, where there are now approximately 30 Gold Medallion Homes.

Knoxville's 1959 Parade of Homes was one of the first in the nation to be all "Gold Medallion." In the 1959 Greater Knoxville Home Show, two booths were used to promote "adequate wiring" with utility personnel on hand to discuss wiring layouts, as well as kitchen and laundry planning.

Under the cooperative arrangement with the Electric League, "adequate wiring" received the attention of all segments of the electrical industry and the Home Builders Association of Knoxville.

Because of the nature of the organization, the Knoxville Utilities Board policy does not permit use of credit plans or subsidies.

# Tampa exposition booth space features Total Electric Home

◆ A TOTAL of 790 homes had been certified as Medallion Homes as of January 31, 1960, in the area served by Tampa Electric Co.

In making the announcement, M. T. Anthony, Tampa Electric vice-president of sales, pointed out that the firm's Medallion Home Program has continually gained momentum since it was begun in June, 1958.

"In January, 1960, for example, we certified 63 Gold and 37 Bronze Medallion Homes in our service area," Mr. Anthony stated.

In order to qualify for a Gold Medallion in Tampa Electric's territory, a home must be all-electric, with a heat pump or a combination of electric comfort heating and air conditioning, have an electric range, an electric water heater, at least three other major appliances, and pass rigid lighting and wiring standards.

A Bronze Medallion is rated by a home that meets the above requirements, with the exception of heating and air conditioning.

Company officials attributed the increase of Gold Medallions over Bronze to greater public acceptance of electric home heating systems.

Tampa was recently selected as the site for one of sixteen Total Electric Homes specially commissioned by Westinghouse to illustrate a growing trend toward electrically heated homes. The home is located in the new all-electric subdivision "Floral Gardens," northeast of the Tampa city limits.

Designed by a Raleigh, N. C., architect, the home has a controlled environment on a year-around basis through the use of air conditioning and baseboard heating units.

Also exemplifying the idea of Total Electric Homes, the Tampa Electric Company featured a 20 by 40-foot display on the Total Electric Medallion Home in this year's Florida Citrus Exposition in Winter Haven.

An actual room, 7 by 9 feet in

**This 20 by 40 foot exhibit has been used effectively on such occasions as the Florida Citrus Exposition to promote the Total Electric Home idea. The small room at the left featured three types of heating.**

**The kitchen area of the Total Electric Home exhibit featured a luminous ceiling as well as modern appliances, cabinets, and wiring.**

size was designed and built to show three major ways in which to heat a home electrically. The ceiling cable, the wall-panel, and baseboard systems were "live" for use in demonstrations, while balanced lighting in the room was controlled by a dimmer switch for variety in lighting.

# Medallion plan gains interest in St. Louis

◆ THE ADEQUATE WIRING program of Union Electric Co., St. Louis, Mo., will be promoted primarily through the Medallion Home Program this year, says Robert L. Coe, residential sales manager for the company.

As it applies to merchant builders, for example, wiring alone may be selected by the builder as his favored promotional vehicle. In this case, the builder would design a wiring system for his homes which meets or exceeds the wiring section of Medallion Home standards. Thus provided, he may advertise his homes as having "Medallion Wiring."

Naturally, all Medallion Homes which have been awarded either the Bronze or Gold Medallion must have complied with, or exceeded, Medallion Home wiring standards in order to have earned the Medallion awarded to them.

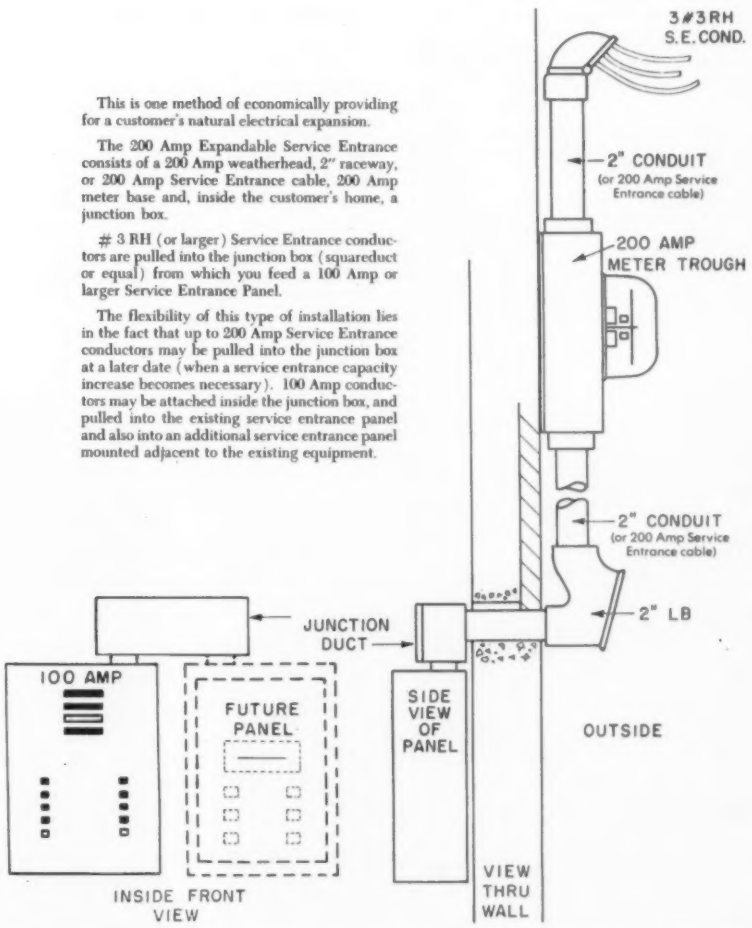
Under this program, wiring, lighting, and appliances have been divorced to the extent that either wiring standards or lighting standards may be accomplished to provide some degree of interest to the merchant builder unable to reconcile himself with going "all the way" and building Gold or Bronze Medallion Homes.

As applied to custom homes, this flexibility is not available. Custom homes are either Gold or Bronze Medallion Homes. Lighting standards for custom homes are those recommended for Medallion Homes, but no recognition is given to these homes unless they "go all the way" and are constructed as Medallion Homes.

In addition, Union Electric has several traveling displays promoting Housepower and larger, expandable services, which are also featured from month to month in the company's show windows and lobbies.

Housepower will be stressed with a demonstration in the 1960 Cooking Schools. Utilizing a mammoth mockup of a fuse, a circuit will be overloaded and the fuse blown. Similarly, more appliances will be used in an adjacent display with no such dire results, showing the benefit of Full Housepower.

The company's Medallion Home and electric kitchen advertising will contain many references to Housepower, Mr. Coe says.


This is one method of economically providing for a customer's natural electrical expansion.
The 200 Amp Expandable Service Entrance consists of a 200 Amp weatherhead, 2" raceway, or 200 Amp Service Entrance cable, 200 Amp meter base and, inside the customer's home, a junction box.
# 3 RH (or larger) Service Entrance conductors are pulled into the junction box (squareduct or equal) from which you feed a 100 Amp or larger Service Entrance Panel.
The flexibility of this type of installation lies in the fact that up to 200 Amp Service Entrance conductors may be pulled into the junction box at a later date (when a service entrance capacity increase becomes necessary). 100 Amp conductors may be attached inside the junction box, and pulled into the existing service entrance panel and also into an additional service entrance panel mounted adjacent to the existing equipment.
3#3RH S.E.COND.
2" CONDUIT (or 200 Amp Service Entrance cable)
200 AMP METER TROUGH
2" CONDUIT (or 200 Amp Service Entrance cable)
2" LB
JUNCTION DUCT
100 AMP
FUTURE PANEL
SIDE VIEW OF PANEL
OUTSIDE
INSIDE FRONT VIEW
VIEW THRU WALL

**Union Electric Company has developed what it calls the "X 200 Expandable Service Entrance" reproduced here from the company's Medallion Home Plan Book. This service provides 100 ampere capacity initially but can be expanded easily to provide 200 ampere capacity.**

# Financial aid ups interest in more power

◆ ALABAMA Power Company's promotion of adequate wiring includes a home owner's assistance program begun last year, says Edward A. Wilson, vice-president of the utility company.

In July of 1959, the company inaugurated a new program for financial assistance to residential customers in the company's area who were interested in becoming total electric users. Essentially, this program provided that for any total electric residential customer, the company would agree to have installed, at its expense, the exterior service entrance wiring, including an exterior combination service entrance panel equipped with six 240-volt circuit positions. The entire service entrance, including the exterior panel, would remain the property of the company, and would be capitalized. Prior to the inauguration of this program, the service facilities which the company owned and installed ended at the point of contact with the customer's residence.

While the program was announced during the latter part of July of 1959, the inability to secure an adequate supply of entrance panels prevented the plan from getting into full swing until September. From September through the end of the year, however, a total of 551 of these panels were issued to customers who had agreed to go "total electric."

# Wichita program holds interest of contractors

◆ "WE DEFINITELY FEEL that the success of our promotion of appliances and equipment can be largely attributed to our continual promotion of our Bronze Award Wiring Program to builders, architects, electrical contractors, and the general public, and to our efforts' acceptance by the industry in general for better wiring," writes Frank Eddins, director of industry relations for the Kansas Gas and Electric Co., Wichita, Kan.

According to Mr. Eddins, this consistent promotion has resulted in a high ratio of electric range and electric dryer sales compared to that of the competition in that area. Results for 1959 show that free-standing range sales, with the exception of extreme low-end models, were predominantly electric. Built-in range sales were in excess of 90 per cent electric, and clothes dryer sales were 81 per cent electric. This, Mr. Eddins says, is exceptionally high, especially so when you consider that the company is situated in a low-priced natural gas region. In fact, Wichita is reputed to have the lowest price domestic natural gas rate of any city in the country in excess of 100,000 population.

An additional reason for the company's belief that their wiring promotion has been effective is the fact that they were unable to use the mass of publicity material promoting 100-ampere service entrance and main panel capacity, because they had built acceptance of a much higher capacity in Wichita homes.

In fact, the company's Bronze Award wiring specifications for houses in excess of 1,000 square feet would require a minimum of 125-ampere service capacity and frequently requires considerably larger facilities. This was accomplished through promotion and recommendations to the builders and electrical contractors. Mr. Ed-

**The single family residence and apartment house service entrances shown here are typical of the 551 such service panels installed in the last few months of 1959 under the Alabama Power Company's new plan which provides adequate service entrance for residential customers who go "all electric."**

**Success of Kansas Gas and Electric Company in promoting greater wiring consciousness is exemplified by this "standing room only" meeting attended by 425 electrical contractors, estimators, and electricians.**

dins points that the company did not rely on legislation, codes, or regulations to determine what was best for the customers.

A typical example of the company's promotion of adequate wiring was the meeting of 425 electrical contractors, their electricians, and estimators in the company's auditorium early this year. The meeting, which was cosponsored by the Building Inspection Department of Wichita and the Kansas Gas and Electric Co., was designed to help those attending better understand the 1959 Electrical Code and to better see their part in promoting wider use of electricity.

"Our field people have found that this meeting and similar ones in the past definitely helped in building a more cooperative climate with electrical contractors and their personnel," Mr. Eddins commented.

# Forums and training courses heighten force of promotion

◆ A SPECIAL INTEREST in electrical heating and air conditioning has sharpened Carolina Power & Light Company's interest in promoting more Housepower for 1960, says the company's residential and rural sales manager, H. B. Hicks.

At present, approximately 80 per cent of their customers have 230 volt entrance service. The majority of these three-wire services are only 60 ampere capacity. This means, for 1960, that many of these homeowners will have to upgrade their service entrance to provide for dryers and window air conditioning units, Mr. Hicks points out. Promotional plans for meeting this challenge will involve the following:

(1) The company will conduct more Housepower Forums in 1960. The Carolina company is using EEI's new training material, and will invite contractors who took the original course along with those who will be taking the course for the first time.

(2) Additional technical training will be offered to contractors throughout the year on such subjects as resistance heating, remote control wiring, motors and motor control, lighting and related problems, grounding problems, new devices and equipment, and other related subjects. Contractors in some of the smaller towns, particularly, have requested this type of training.

(3) The company will encourage the formation of electric leagues and will work to strengthen those now in existence.

(4) The Housepower program will be supported with newspaper, radio, and television advertising.

(5) Full Housepower will be required for all Gold and Bronze Medallion Homes throughout the company's area.

According to Mr. Hicks, the company considers that the crux of their program will be to stimulate greater interest on the part of electrical contractors to sell quality wiring. They propose to accomplish this throughout the year through personal contacts with contractors, he said.

# Publicity gains big response for home show

◆ COMPLETE DETAILS for the 1960 electrical promotion for the Savannah Electric and Power Co., of Savannah, Ga., have not been formulated. However, they are definitely scheduled to include subsidies for increased wiring installations in both old and new homes, according to Wade B. Evans, commercial sales engineer for the company.

In line with promotion of increased power capacities, one of the company's promotional highlights this past year was a jointly sponsored "Cavalcade of Homes." The 17-day Cavalcade was designed to stimulate interest in the opening of Wilmington Park, Savannah prestige residential community. The three-way promotion was sponsored jointly by the William Lattimore Co., land developers: the Savannah Electric & Power Co.; and Westinghouse Electric Corp. The Cavalcade featured 18 Gold Medallion Model Homes by 18 different top quality builders, and included a price range of from $17,500 to $35,000.

In spite of bad weather, an estimated 25,000 persons visited what is thought to be one of the largest

*(Continued on page 32)*

# 16th annual national wiring

**This article should be especially helpful to the following readers:**

- Electrical Contractors
- Electric Utilities
- Electrical Wholesalers
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

◆ SPEAKERS at the 16th Annual National Wiring Sales Conference urged 282 conferees from all over the United States to use various "effective methods for increasing profits all around—to the contractor, the distributor, the manufacturer and the utility." The conference was held February 25 and 26 at the Warwick Hotel in Philadelphia.

Electrical wiring—or rather the lack of it—is the great bottleneck to greater prosperity which would otherwise result from the increased sale of electrical appliances and machinery for homes and for commercial establishments, and from increased consumption of electricity, generally.

Representatives from power companies, electrical leagues, electrical contractors, manufacturers and distributors attended the conference, conducted by the National Wiring Bureau, which is sponsored by five major electrical trade associations representing every segment of the electrical industry.

### Industry programs integrated

The residential wiring problem was attacked on all major fronts. The integration of the three major residential programs of the industry was clearly defined by representatives of their respective associations.

The $2½ million advertising expenditure of Edison Electric Institute in national consumer magazines (*Life, Saturday Evening Post* and *Better Homes and Gardens)* as outlined by Ralph Zeuthen, manager of the LBE program is providing a strong desire on the part of the consumer to "live better . . . electrically". Laurance C. Messick, director of the Medallion Home Program (for which responsibilities are shared by EEI and the National Electrical Manufacturers Association), and Frances Armin, director of the National Wiring Bureau's Residential Program, explained how their 1960 plans were developed in conjunction with EEI's for maximum effectiveness and optimum benefit for local industry tie-in promotions.

### Course for contractors

A brand new course for electrical contractors entitled the "Housepower Profit Clinic," developed by EEI, was described by John Catherwood, coordinator of market development and training for the Long Island Lighting Company, Mineola, New York.

The Housepower Profit Clinic tackles the "profit problem areas" of: (1) managing the business, (2) advertising and promotion — involving planning, and budgeting advertising expenditures, detailed discussion of different types of advertising, (3) personal selling, which involves the basic reasons why people buy, (4) "Plus Profit Items" which refer to the many relatively new contractor installed devices that have come on the market, such as appliance centers, dimmer switches and built-in lighting, low voltage wiring, driveway heating cable, etc. These are the "glamour items," said Mr. Catherwood, "that add prestige, excitement and profit to the contractors work," and (5) selling in new home construction market.

### Local promotions reviewed

Several outstanding local residential wiring promotion programs were reviewed. "How a Distributor Promotes Housepower," was described by John Clark, general manager of the Noland Credit Corporation, and E. M. Myers, manager of merchandising, Noland Company, Newport News, Virginia.

"Utility Employees Promote Housepower," involving a case study of a unique utility program aimed at building residential rewiring business, was presented by C. E. Anderson, sales promotion manager of Virginia Electric and Power Company, Richmond, Virginia.

"Certified Wiring and the Medallion Home" by J. D. Hampton and Tom A. Edwards, of Oklahoma

**THEY ASKED THE QUESTIONS**
**William G. Hills, manager of the Electric Institute of Washington, D. C., headed a trio that fired questions at the directors of the principal electrical promotion programs. Left to right, Joseph Hollenbach, Philadelphia Electric Co., Mr. Hills, and Gordon Beeler, also of Philadelphia Electric Co. Their questioning brought out the facts.**

# sales conference

Gas and Electric Company and the Arkansas Adequate Wiring Bureau, respectively, analysed two different approaches to the new home construction market.

*Look* Magazine award-winning electrical contractor Emmett Pritchett of Milwaukee, Wisconsin, gave details of his successful and profitable campaign to sell residential wiring.

### Keep pace electrically

On the commercial wiring front, the industry's 1960 plans, according to Andrew Corman of the National Wiring Bureau, for the new promotion slogan "Keep Pace Electrically," include national advertising by the National Electrical Contractors Association in *Fortune*, and *Business Week* and by electrical manufacturers in such magazines as *Time, Fortune, Newsweek, U. S. News and World Report, Business Week,* and the *Wall Street Journal.*

An analysis of profit possibilities in this commercial-industrial electrification market was presented by M. G. Kennedy, of Ebasco Services, Inc., New York. C. L. Crouch, technical director of the Illuminating Engineering Society, New York, basing his theme on the Blackwell Report, told conferees about re - lighting opportunities which lead to wiring sales. He cited many industrial re-lighting examples that actually "prove out in everyday practice," in substantial benefits to the respective companies.

Electrical contractor F. E. Keith, of Keith Electric Company and chairman of the Marketing Committee of the National Electrical Contractors Association, outlined NECA's Contractor Development Program which provides help in the operational, administrative and financing aspects of the contractor's business. The program, said Keith, "is intended to develop consciousness of the need for marketing capability but it does not attempt to supply ways and means of achieving that capability."

Coburn Hollister, general sales manager, Niagara-Mohawk Power Corporation, Syracuse, New York, described how one Adequate Wiring Bureau used direct mail to promote commercial wiring business for its members. This is the most intensive effort thus far of any area to promote commercial rewiring specifically.

Julian Zimmerman, commissioner, Federal Housing Administration, Washington, D. C., discussed FHA's new Minimum Property Standards which became effective July 1st last year and which closely parallel the National Electrical Code. Mr. Zimmerman also referred to the eligibility of built-in kitchens and built-in appliances under FHA Title I.

### NEMA market oriented

President of NEMA, N. J. MacDonald, who is president of the Thomas & Betts Company, Elizabeth, New Jersey, summarized the conference and sounded the rallying cry for the industry to "go to work." Mr. MacDonald outlined the new reorganization of the National Electrical Manufacturers Association, calling attention to its "market oriented" set-up in its eight divisions.

Under its new organization, NEMA divisions have considerable autonomy acting almost as eight different trade associations with attendant benefits especially in promotional and business development areas. The National Wiring Bureau derives its operating funds from NEMA, administered through NEMA's Business Development Committee. The NEMA Adequate Wiring Committee is a sub-committee devoted to the National Wiring Bureau. C. W. Higbee, Kaiser Aluminum & Chemical Corp., is currently chairman of this committee.

Other speakers included: Milton Allen, vice-president in charge of sales, Philadelphia Electric Company; W. T. Richards, vice-president of sales, Indianapolis Power and Light Company; Arthur E. Bertke, president, Bertke Electric Company, Cincinnati and Lester E. Barrett, president, Barrett Electrical Supply Company, St. Louis, and chairman of the National Wiring Bureau, who substituted for C. W. Higbee, of Kaiser Aluminum and Chemical Corporation.

The 6th Annual *Look* Magazine Award presentations for outstanding performance in residential wiring promotion were made by Richard P. Harmel, manager, Markets and Merchandising Department, *Look* Magazine, New York.

Open forum discussions on wiring sales and promotion techniques were held for residential and commercial markets. Herbert E. Cook, executive secretary, Electrical Association of Detroit, moderated the residential forum, and Sydney C. Blumenthal, Jr., president of Blumenthal-Kahn Electric Co., moderated the commercial forum.

**THEY GAVE THE ANSWERS**
**Asked leading questions by "congressional style" committee, these experts gave the highlights of their 1960 programs. Left to right, Ralph Zeuthen, manager, Live Better Electrically, EEI; Laurance Messick, director, Medallion Home Program, NEMA; and Frances Armin, director, Residential Program, National Wiring Bureau.**

# Sales training for contractors through proposed new institute

*(Highlights of address by F. E. Keith chairman, Marketing Committee, National Electrical Contractors Association.)*

◆ SOME of the basic findings of our research explain why in the past the electrical contractor tends to be a negative sales force. Let me assure you that the electrical contractor was no more negative in his sales approach to his markets than any of the other general or specialty contractors serving the construction market. In fact, he stands head and shoulders above the others. The same conditions that tend to minimize his sales drive affects all other contractors in construction. They are the victims of a system and a practice.

The system that tends to stifle creative sales effort in construction is competitive bidding which provides the customers of construction services the unique service of quoting a price backed by contractor to perform without the customer spending a cent except for plans. As a result the contractor has no part in the design, and as competition increases, the only thing he has to sell is price and all of you are sophisticated enough to know what that does to quality and real values, especially where the customer is not a skilled buyer of construction services and cannot accurately determine that he is getting performance, as is usually the case with smaller jobs.

It is taking all the magic of Housepower, the Medallion Home, and the All-Electric Home to restore wiring adequacy to our homes that have been victims of this bidding competition running wild. Price-only had reduced the quality of electrical home installations to a bare minimum. There is a point beyond which competitive bidding is not an economical method, and practically all small work in the electrical modernization field falls well below that point.

This is not to say that there should be no competition for this work. Far from that. But the competition should be on a selling basis—creative selling—in the customer's interest—negotiation—instead of formal bidding which is not justified by the size of the job. In the servicing of small work the willingness and ability to render service—engineering service, even though on a small scale—is more important to the customer than a few dollars in price.

### Contractor attitudes

Our research showed that the contractor had two serious blocks to creating business through selling. He had become accustomed to operating in a market controlled by outside factors that reduced his role principally to bidding on a price basis. He assumed the role of a professional to whom business in his specialty should come of its own accord, and he did not seek it.

Obviously, our programs must be aimed at changing these attitudes and the only way that they can be changed is to make it profitable to change. And to make it profitable to change, we need a lot of understanding and help.

The Contractor Development Program, aimed at alerting management to its problems and opportunities and improving its skills, is not sufficient to do the job. The research study showed conclusively that the only sure way an electrical contractor could develop into a sound, profit-making operator is to do it by the "earned route;" that is earn what the market has to offer. In a word, that means selling.

We are not suggesting that competitive bidding be abandoned altogether. It has its place and is vital to the new construction market. But the big need, and the opportunity that is even more immense than the new construction market, is the huge modernization, maintenance, and repair field where the need of the combination package of engineering, skill and management beckons us. The Contractor Development Program can only create the decision to serve this market and provide help in the operational, administrative, and financing aspects of the business. It is intended to develop consciousness of the need for marketing capability but it does not attempt to supply ways and means of achieving that capability.

Let us suppose that a contractor, after making his self-appraisal, has decided that he must do something about his sales capability. He becomes sold on selling as a way of building profitable business.

What is his big need of that moment? He needs a salesman—someone to do this selling. The chances are that he is not a trained salesman. The nature of the business invites talents lying in other directions. Even if he were a trained and accomplished salesman, he is only one man and he needs others.

Where can he find a salesman? There are very few salesmen specifically trained to sell electrical contracting services. Those few who exist are guarded like a treasure by the fortunate contractor organizations that employ them. Obviously, a pool of trained contractor salesmen must be developed.

### Sales training plan

NECA has come up with a plan, a logical sequel to the Contractor Development Program, to do that job. We propose to establish in a fixed location an Institute of Contractor Sales Training for the Electrical Industry. Note that this is training for contractors and their personnel but it is in behalf of the entire electrical industry.

The Institute would provide intensive training of contractors and their present or prospective personnel in the ways of selling electrical contractor services to the public. We do not have in mind a full course in salesmanship. Rather, we are thinking along the lines of a course of instruction of a very intensive nature extending over 10 days to two weeks that would give the rudiments of selling plus the specific applications of selling services in this field, which would, of course, include residential, commercial, industrial and others, and would treat with such developments as electric heating, area diffused lighting, controls, and communication.

The purpose of this Institute is three-fold: First, to provide electrical contractors with personnel that have had competent instruction in both basic and specific selling of construction services.

Second, to shift to electrical contractors a major part of the burden of selling. Logically, they should shoulder this because they are the point of contact with the construction customers. When those not di-

*(Continued on page 136)*

# make EXTRA money with *Smithcraft* SPEEDOMATIC TROFFERS

Smithcraft Speedomatic Troffers make extra money for you on installation after installation, with these time-saving, contractor-minded features:

*One-man installation — only required tool is a screwdriver.*

*Self-aligns to fit 1/8" variance in ceiling openings. Door frame adjusts as easily as a telescope.*

*Only 4 1/16" deep, allowing maximum room for utilities.*

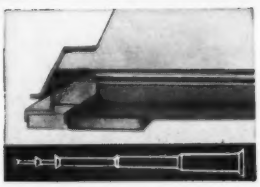
*Fast, easy wiring, with large wiring access door, wireway and end openings.*

*Four basic types fit 101 ceiling systems.*

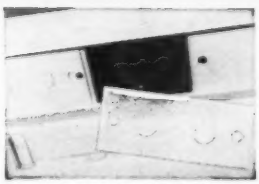
*Packed two to a carton for faster installation, with or without door frame installed.*

*Light-conditioning by Smithcraft — America's finest fluorescent lighting*

## *Smithcraft Lighting* CHELSEA 50, MASSACHUSETTS



Door frame adjusts like telescope, assures perfect fit — even in irregular ceiling openings.



Wiring access door speeds installation — large enough to reach through for feed wire.

Troffer installs in seconds from below, with time-saving mountin brackets, double-fas levelling screws.

## Home show response

*(Continued from page 27)*

and most successful home shows ever presented in southeast Georgia, Mr. Evans says. Approximately 7,000 people braved 26-degree weather (exceptional for Savannah) on a Sunday afternoon to visit the 18 homes on the ¼ mile linear curved main road.

### Total Electric Home exhibit

As a special attraction, the famous Westinghouse Total Electric Home exhibit was shown. This exhibit was installed in a huge tent where the traffic was routed from room to room to give the public an actual demonstration of the ultra-modern electrical equipment now available. Many of these same electrical features, such as entertainment centers, appliance centers, and low voltage remote control wiring, were included as standard equipment in the homes on display.

Although the exhibit itself was all Westinghouse, other appliance manufacturers were also invited to participate. General Electric, Hotpoint, RCA Whirlpool, and Suburban were represented in the showing. Heat pump manufacturers represented were Westinghouse, Fedders, Perfection, Lennox, Weathermaster, and General Electric. One home installed Robbins & Meyers resistance baseboard heaters, while all others were equipped with heat pumps. Every home in the group included a 200 ampere service entrance.

### Contest spurs interest

To make people more electric-minded, the Savannah Electric and Power Company promoted a contest during the Cavalcade. Blanks were furnished for contestants to list all the ways one may "live better electrically," plus a statement as to which appliance they liked best and why. Substantial prizes were awarded.

A 44-page brochure describing the new homes in detail was distributed free of charge to all visitors of the Cavalcade. Also during that time, a 20-page newspaper special tabloid was run in both the *Savannah Evening Press* and in the *Sunday News*. Saturation television and radio spot advertising was also used extensively during a three-week period, augmented by daily newspaper ads which alternated between the local page, real estate pages, and the general sections of the paper.

**Visitors examine panels showing some of the electrical equipment required in a Full Housepower home. New Orleans Public Service, Inc. was one of the sponsors of this informative exhibit.**

# Heavy emphasis on advertising in New Orleans

◆ NEW ORLEANS Public Service, Inc., has been aggressively promoting adequate residential wiring since the inception of the national program by the National Adequate Wiring Bureau in the late thirties, says A. B. Lindauer, dealer sales manager for the company.

The local activity has tied in with the certification program of the electrical association of New Orleans, Inc.

In past years, they have sponsored exhibits in home shows; provided advertising assistance and personnel for display homes that had certified wiring; made wiring layouts for builders and individual home owners; sponsored "Housepower Forums" at a local university for contractors; advertised the advantages of certified wiring and later, "Full Housepower"; devoted show window and floor space to wiring displays; and told the story of the need for improved wiring through the efforts of all members of their sales department.

During the 1959 National Home Week promotion, 15 of 18 houses in the New Orleans Parade of Homes featured Full Housepower with certified adequate wiring. The houses were "flagged" to the public not only by the "A-W" signs, but also by photo-electric cell controlled lanterns and illuminated house numbers which were furnished builders for each qualified "Parade" home. A special newspaper section carried a company advertisement featuring these houses and each builder's ad carried Housepower copy. These promotional helps were specially arranged for National Home Week and are not offered to the builders throughout the year.

On a year-round basis, the company offers residential home builders advertising assistance for homes which qualify for Full Housepower through certified adequate wiring.

The New Orleans utility is continuing their advertising program in 1960. Plans include all the activities found to be successful in the past, including an exhibit in the spring Home Show, plus cooperation with home builders during special promotion events.

This is of necessity a long range program, but the results are already being realized.

# Complete new book on General Electric Remote-Control Wiring – available free

32-page G-E Technician's Manual tells you everything you need to know to install this leading low-voltage system

There's big new appeal in G-E Remote-Control Wiring, for homeowners, architects and builders.

There's a big new *profit* opportunity for electrical contractors who install it! This new General Electric book tells you how.

You get the technical information you want, on the advantages, planning, estimating and installation of modern G-E Remote-Control Wiring.

And, you start off with the best known *name* in the electrical industry. You get more important features in the General Electric low-voltage system — at lower cost. According to a nationwide survey, G-E Remote Control is the first choice of progressive contractors who do low-voltage work.

*Progress Is Our Most Important Product*

**GENERAL ELECTRIC**

**Get your copy! Mail this coupon, today.**

GENERAL ELECTRIC COMPANY
WIRING DEVICE DEPARTMENT
PROVIDENCE 7, RHODE ISLAND

Gentlemen: I want to get started in this profitable, "trade-up" field. Please send me a free copy of your "Technician's Manual on G-E Remote-Control Wiring."

NAME .....

COMPANY .....

STREET .....

CITY ..... STATE .....

# A new slogan to promote commercial and industrial wiring modernization

By Andrew Corman
National Wiring Bureau
New York, N.Y.

**This article should be especially helpful to the following readers:**

- Electrical Contractors
- Electric Utilities
- Electrical Wholesalers
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

◆ THE UNDER-LIT, under-powered, under-wired commercial market has long cried out for a common focal point behind which all branches of the electrical industry could rally as they have behind "Live Better Electrically" in the residential market. Now, beginning in 1960, we have just such a theme —a theme that has been received with enthusiasm everywhere it has been introduced.

Here it is: "Keep Pace Electrically"—a bold, quickly understood emblem. It's not just for today—but for years to come. It doesn't stand just for wiring but for the benefits of wiring—all the many varied applications of electricity that can enhance profits, production, and efficiency for customers. After all, when you get right down to it—these benefits are the only things that really sell customers, and they will be stressed constantly as the program develops.

We think that throughout the 60's, contractors will use the Keep Pace Electrically emblem—and the idea behind it, to sell more commercial wiring and lighting. Utilities will use it to stimulate load-building, and manufacturers to sell more distribution and utilization equipment.

Keep Pace Electrically was first introduced last November to manufacturers and allied associates attending the annual meeting of the National Electrical Manufacturers Association in Atlantic City, and to electrical contractors convening at the NECA meeting in Miami Beach.

The official launching — to the business world in general and to the prospective commercial customer in particular — was made during National Electrical Week just past with full-page advertisements, paid for by NECA as a sponsor of the National Wiring Bureau, in *Fortune* and in *Business Week*. All through 1960 it is being backstopped by a campaign sponsored by the Bureau in selected business and commercial publications.

The Wiring Bureau's Keep Pace Electrically ads will reach many contractors' prime prospects for commercial modernization. The advertising, emphasizing the gains when prospects Keep Pace Electrically, will run 122 times in 19 business and commercial publications.

### 13,000,000 ad messages

All-told, this means an advertising impact of more than 13,000,000. In addition to 13 appearances in *Business Week*, there will be six in each of the following publications—*Nation's Business, Today's Business, Buildings Magazine, Food Service, American Druggist, Progressive Grocer, Tourist Court Journal*, and the management editions of all eleven *Profit Parade* periodicals.

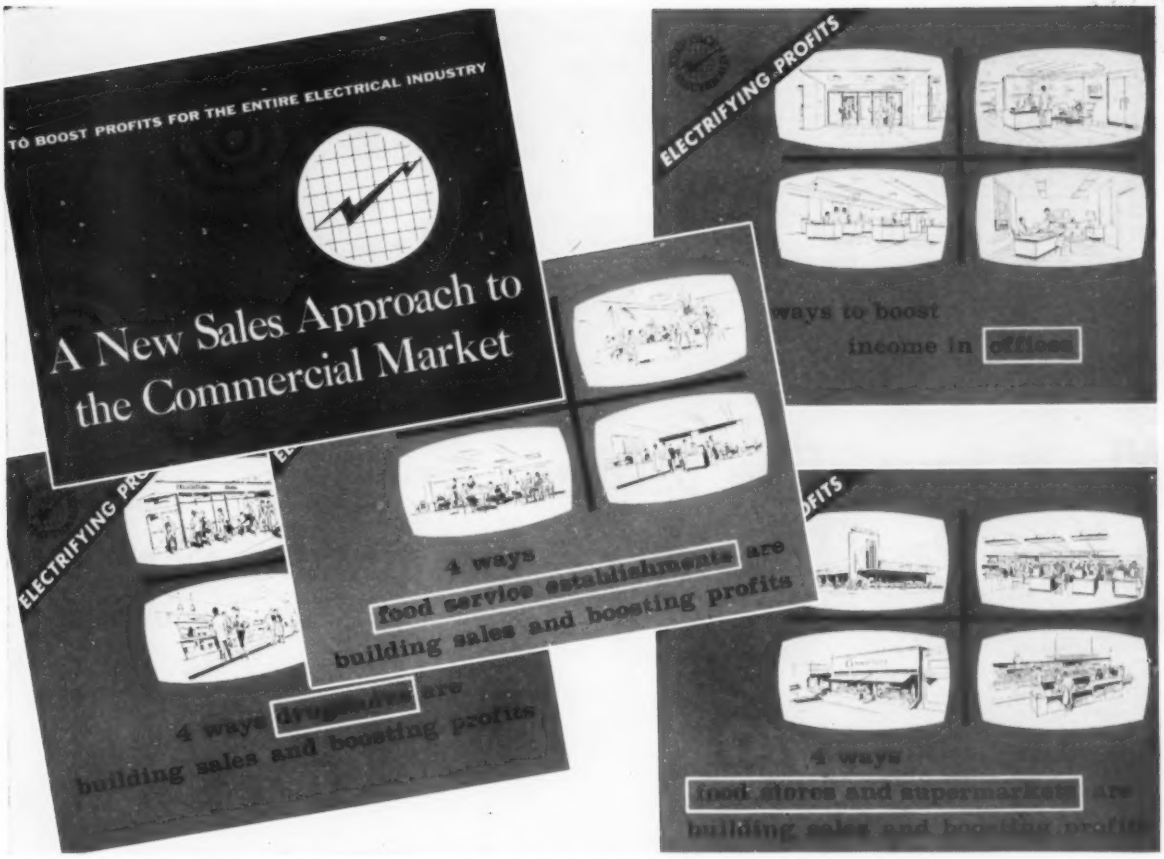
Keep Pace Electrically is a concept that utilities can and will use to spotlight electricity as the most economical and efficient way for commercial and institutional users to keep pace with the ever-expanding needs of a growing economy. For example, as a continuing effort to stimulate commercial modernization jobs, the Union Electric Company had a tear-off business reply card inserted in 25,000 copies of the February issue of *Today's Business*, for distribution to the commercial prospects in the St. Louis area. The front of this insert shows the Keep Pace Electrically emblem. The reverse side shows a futuristic version of the downtown section of the great city on the Mississippi which is now undergoing a dramatic face-lifting job. This illustration is accompanied by a brief sales pitch.

Keep Pace Electrically offers a quick way for manufacturers to show how their products will help potential customers maintain or improve their competitive position —*and* step up their profits.

### Extensive use of emblem

The fact is that manufacturers are fast becoming aware of this. Forty of them have already told us they plan to tie the emblem and theme into their own advertising and promotional efforts. To cite just one example, the Allis-Chalmers Manufacturing Company scheduled a full-page ad in *Electrified Industry*, and a two-page spread in *Fortune, Time, Newsweek, Business Week, U. S. News & World Report*, and the *Wall Street Journal*, during National Electrical Week. Proofs of these ads were included in a National Electrical Week promotion kit available to the industry.

Ads are available in mat form for use in whole or in part by electrical contractors. And there are many other promotional materials available to contractors. Keep Pace Electrically provides a central fo-


TO BOOST PROFITS FOR THE ENTIRE ELECTRICAL INDUSTRY
A New Sales Approach to the Commercial Market
ELECTRIFYING PROFITS
ways to boost
income in offices
4 ways
food service establishments are
building sales and boosting profits
4 ways
food stores and supermarkets are

**Wide range of literature ties in with "Keep Pace Electrically" program.**

cus for contractors in their efforts to sell commercial customers. It gives them a "nationally advertised commodity" which will make their selling easier.

What we in the industry, imbued as we are with the value of electricity and its importance to the proper functioning of equipment and applications of all kinds, are apt to overlook is the fact that most commercial prospects underestimate the power of electricity to step up their efficiency, service, and profits. Like the proverbial Missourian, they have to be shown.

The new Keep Pace Electrically program helps the electrical industry to show them! Tie your own advertising and promotion to it and you'll help increase the over-all industry impact — and thus help your own cause. As your prospects plan to remodel or build to grow with their market, it keeps their attention consistently focussed on your products and services.

The campaign symbol is bold and simple to promote. It has instant appeal to retailers, office management, plants, industry, hospitals, schools, all commercial users big and small. So use it in your advertising and merchandising campaigns—display it prominently—it's the key to greater profits for your customers and for you.

To help you enjoy the benefits of this campaign, a special program planning guide called, "A New Sales Approach to the Commercial Market," has been prepared. It contains suggestions for every branch of the industry on how to tie in with the NWB program—in advertising, promotion, and merchandising. In addition, it contains a complete pictorial catalog and price list of all the materials available for this purpose.

Keep in mind that the emblem can be displayed on buildings and at job sites—on truck panels and show windows—on jacket lapels and letterheads. You can feature it prominently at company and community meetings, at special exhibits, during sales calls, on bus and car cards, publicity photos, TV spots, newspaper advertising, outdoor signs, literature, in fact, on all promotion you do.

To help you in your promotion activities, the Bureau has developed a supply of stencils, banners, decalcomanias, buttons, postage meter slugs, logotypes, mats and electrotypes, all available at cost. Glossy reproducible photostats of the emblem may be had free of charge to enable you to work out any of these things on your own, should you so prefer.

A direct mail piece in the form of an envelope stuffer has been added to the roster of Bureau literature and all key existing pieces have been imprinted with the Keep Pace Electrically emblem to bring them up-to-date.

Notable among these is the Bureau's brochure, "The Big Difference," which belongs in the sales kit of every utility, contractor, distributor and manufacturer's representative interested in commercial wiring promotion. As a matter of fact, the national advertising by the Bureau suggests to the businessman that he call on his con-

tractor or write to the Bureau for a complimentary copy of "The Big Difference." This, of course, will help obtain leads for the industry. The names of those who request the brochure will then be forwarded to local areas for follow-up.

Naturally, the National Wiring Bureau will stimulate industry participation in the Keep Pace Electrically concept through visits to the field, bulletin service, and reports in two new publications. These are the Wiring Promotion Reporter, the tabloid sent to utilities, distributors, leagues and NECA chapter managers and others—and the Profit Idea Digest, the news-letter distributed to individual electrical contractors.

The objective of the Bureau's program for 1960 has been largely to introduce the emblem itself. So far we have developed one booklet, "The Big Difference," which emphasizes profits. We expect to extend the coverage of the benefits theme into different areas in future years so that, eventually, we will have a series of booklets, one slanted toward efficiency, one toward production, and one toward learning as well.

# Why it pays office building to Keep Pace Electrically

*(Highlights of address by Barry M. Dietrich, vice-president, Frame Electric Co., Pittsburgh electrical contractors.)*

◆ WE WANT TO DISCUSS here the benefits a building owner can get from a modernized wiring program. Program, that is a key word. In our experience no adequate modernization job was ever done as a one shot deal. Each job requires virtually a period of incubation to accomplish the program development and the owner's willingness.

It is often necessary to modernize the owner's thinking before the wiring itself can be improved. Usually the owner has struggled along year after year with his electrical system growing less adequate and becoming more costly to maintain until some major failure occurs. Then he scurries to the yellew section of the 'phone book or looks in his Building Owners and Managers Handbook and calls the electrical contractor with the biggest ad—or, to face facts, the three contractors who "look good."

He tells them all that "something must be done"! Then typically, as proven in surveys made by the National Electrical Contractors Association, the contractors grind out a "quick and dirty" solution to the building's worst problem. For example: the 400 ampere switch feeding north shaft floors five and six is overheated and to be replaced. They submit a proposal covering replacement of this switch (new fuses and 4% sales tax included) for the lowest possible figure so they can get a "foothold" in the building.

Let me hasten to add that electrical contractors have failed most to evolve the program type of approach because they rarely get paid for engineering layout or consulting services. On the other hand, I think the equipment manufacturers, utilities, and local electric leagues have done the best job in preparing and disseminating program planning information.

The fact remains that a long-range complete modernization program is the only deal that any thinking building owner should accept. Such a program can be sold outside the realm of price competition, if the owner feels it will give him long-term benefits and means of reducing costs.

Also, by definition, a program consists of a series of sequential parts — planned steps in chronological order. It gives us the opportunity of selling the building owner just what he needs right now (if his funds are limited) and at the same time assures that the parts of the installation deferred until later will build effectively on the initial phase to ultimately produce a modern wiring system having flexibility, economy, and efficiency. Only through such a program can we hope to give the office building owner the benefits which we will now discuss:

### Advantages of modern wiring

The one all inclusive advantage of modernized wiring for an office building is that it enables the owner to be competitive in obtaining and keeping tenants. After all, that is the prime purpose of his building's very existence! The ability to be competitive by possessing a modern electrical system gives a host of specific benefits to the owner.

Most important from the entant's standpoint are the appearance of his own rented area and the amount of electrical service provided to him. In our experience, modernized wiring becomes necessary in older office buildings because of three factors: higher lighting levels; installation of air conditioning equipment; and increased use of data processing machines. These things were not anticipated in the original building designs.

Most building owners are aware of these factors which demand more and better wiring but they often don't realize all of the specific benefits which result from improved wiring. It goes almost without saying that the building owner recognizes the value of modern lighting to enhance the appearance and usefulness of his building especially in the entrances, lobbies, corridors, and other public areas.

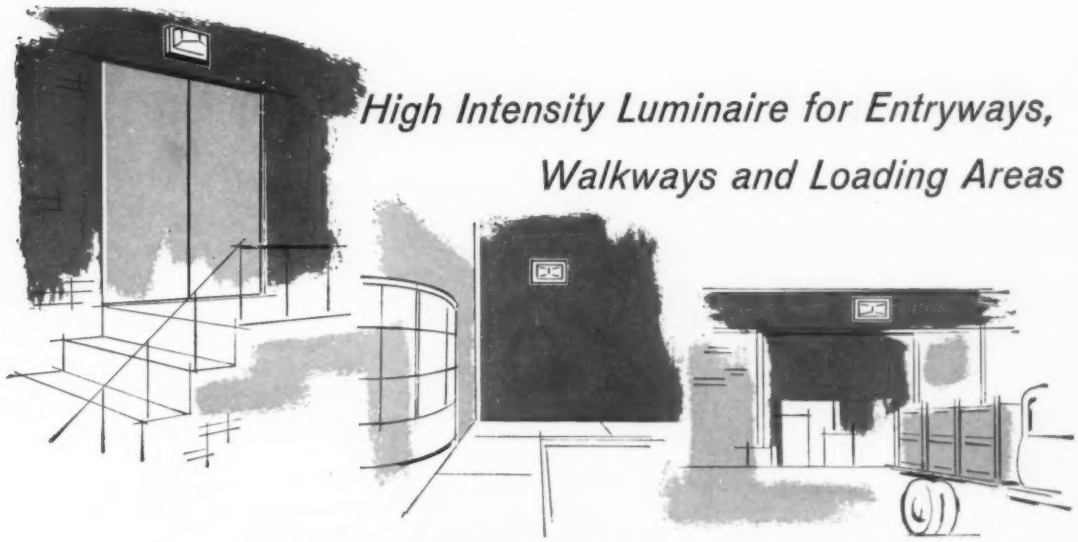
But appearance is not the only benefit of modern wiring which enables the owner to meet or surpass competition; there are other factors which the tenants never see and are conscious of only occasionally. Most important of these is economy of operation.

### Economy of operation

Operating expense can often be reduced by power factor correction when utility companies impose a penalty charge which increases as the building power factor goes lower. The utility company has no aversion to collecting this additional money from the owner and sometimes will squawk only when the power factor drops to a value where the utility lines are carrying abnormally high currents for the real power being consumed. This condition often passes the point where the building owner would have been wise to install corrective equipment and thereby reduce the penalty charge.

Dollars also can be saved within the building because power factor correction can reduce the current loads on breakers, switches, feeders, transformers, in fact throughout the electrical system. It costs money to produce the heat caused

*(Continued on page 134)*



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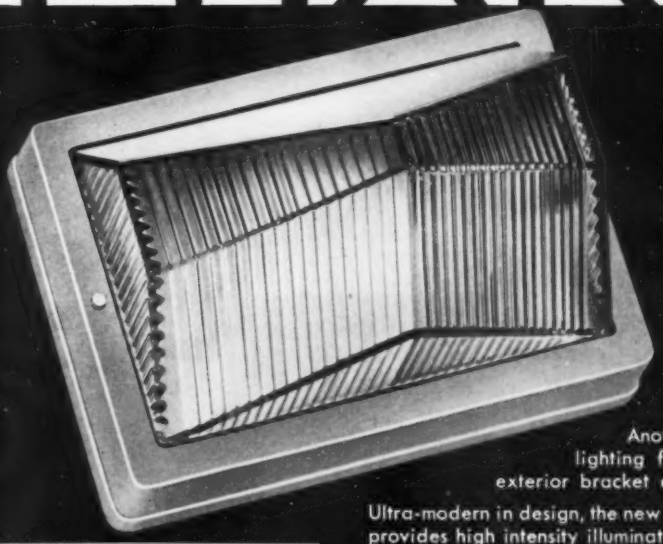


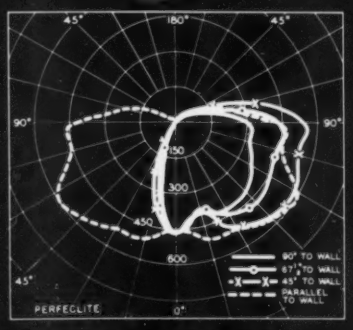
*A Totally New Concept In Controlled Exterior Illumination*

Another first from Perfeclite! A modular shaped lighting fixture that completely outmodes the usual exterior bracket extending on a heavy arm from the wall.

Ultra-modern in design, the new Pharos gives an asymmetric light pattern . . . provides high intensity illumination for wall areas . . . disperses a powerful outward distribution of light 90° from the wall as well. The heat-resistant glass refractor uses accurately calculated prisms on seven transmission surfaces . . . incorporates a silvered glass reflector at the top which directs the light downward.

Made of cast aluminum, gasketed and weatherproofed, the Pharos opens on concealed hinges for easy relamping, easy maintenance. It is rated at 200 watts, utilizing a standard A-25 lamp.

*For further information, mail the attached coupon today!*

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# Adequate switching through

By Harry J. Miller

**This article should be especially helpful to the following readers:**

- Electrical Contractors ✓
- Electrical Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers ✓
- Consulting Engineers ✓

*This is the second of a series of three articles on low voltage remote control wiring. The third and concluding article of the series, covering commercial and industrial applications, will appear in the June issue.*

◆ WITH INCREASING COMPETITION, and ever-increasing emphasis on electrical living and adequate wiring, Florida contractors who at first hesitantly approached the subject, are now eyeing low voltage remote control systems in residential and commercial and industrial wiring as an added opportunity to wring a higher profit from every job—and to land more jobs.

Those contractors who are aggressively selling low voltage systems (and they are all in accord in their avowal that this is something that has to be sold) admit that the first job or two may be troublesome since the wiring of multiple switching appears deceitfully complex. Actually, this system is possessed of basic simplicity, and there is almost universal agreement that low voltage switching provides a new dimension and freedom in the design of residential circuit control.

The system offers a safe means of circuit switching that creates a new level of convenience for the home owner. Surprisingly competitive in cost to conventional wiring switching, it is often the ideal—sometimes the only—solution to some wiring problems.

Aside from the undeniable advantage safety-wise of having only low voltage at switch level instead of 125 volts, low voltage control offers the electrical contractor a simple and practical solution to both normal and unusual control problems, besides enabling him to install wiring in structural components which bar any economically feasible installations of conduit, EMT, or metallic or non-metallic sheathed cables.

Besides offering easy and economical central or remote control of distant outlets, an unlimited number of switching points, selective control of section lighting, a low voltage system is economical to install and maintain, and its flexibility over conventional wiring is undeniably superior.

### LVRC often specified

Says George Cervone, of Sarasota's Whelchel Electric: "The low voltage systems we're installing are primarily in homes in the $18,000 - $40,000 bracket, and they're being specified by the architects. In each case the jobs run from $250 to $300 less than a comparable conventional wiring installation. And we expect this difference will be even more

**Remote control provides a good opportunity for "selling up." In this remodeling job, Baccus Electric upgraded the wiring from an original estimate of $1,200 to $2,000 by selling remote control.**

**A number of recessed units were installed to light this lengthy garage. Pilot lights are appropriate for remote garage switches where position of relay is not readily apparent at the switch location.**

# low voltage remote control

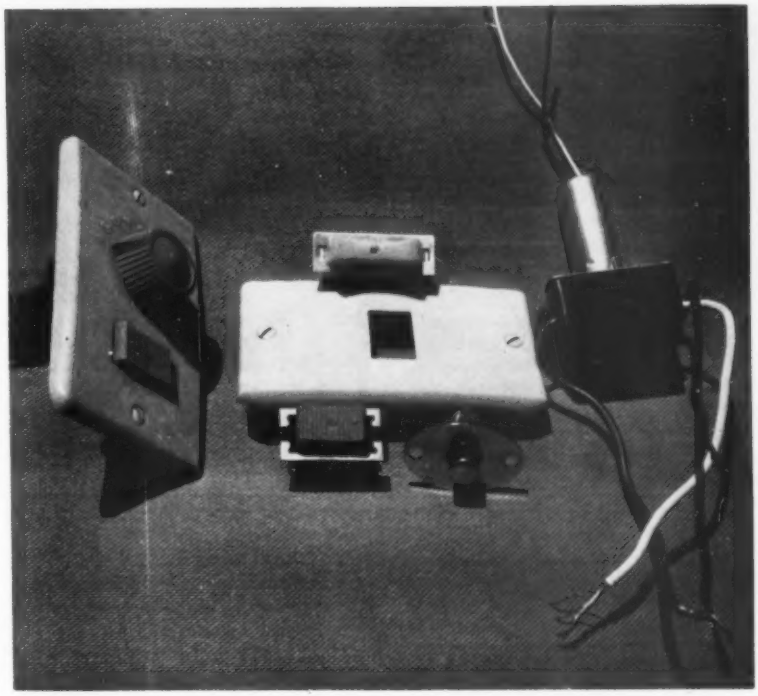
noticeable as more such systems are sold and components get cheaper.

"We're installing around 108 outlets in each of these houses, with such wiring as ceiling lights in each corner of the living rooms, and exclusive of outlets for service or power equipment.

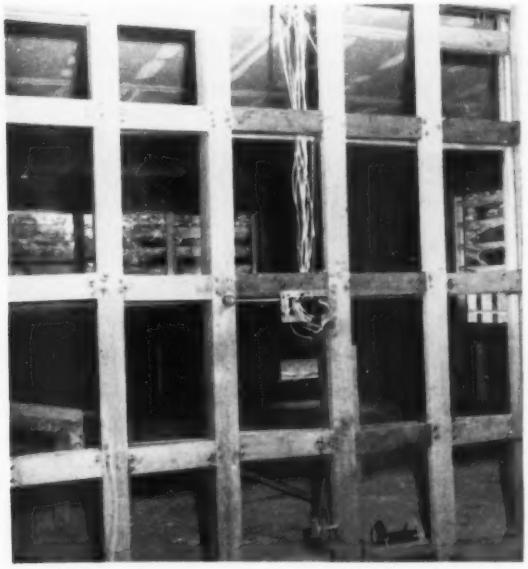
"We're finding our labor costs are less on these jobs because houses that sell for these prices invariably have a preponderance of glass, sliding doors and window spacings in which it would be difficult, even impossible at times, and extremely wasteful of labor to attempt to install the boxes and conduits of orthodox wiring.

"For example, a sliding door leaves scant room for any such installations, whereas the small flexible #18 wires in a low voltage system can be tucked into the most cramped spaces, permitting switching at the nearest structural point that complies with the architect's idea of convenience."

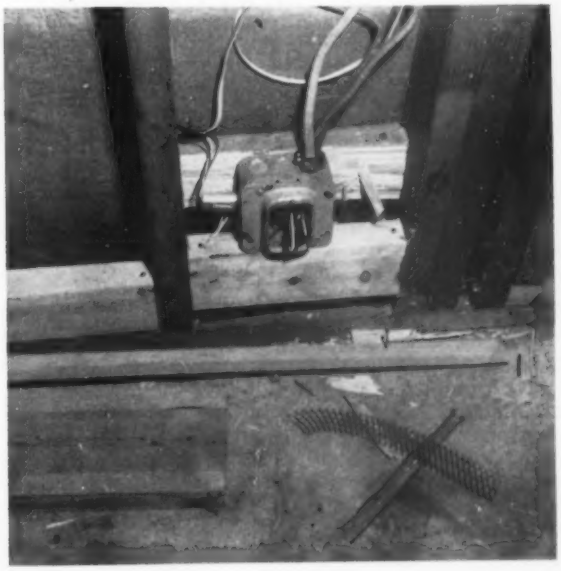
Says Kenneth Brumbaugh, electrical engineer with the Whelchel



**Low voltage components are few and easily wired. They blend with any decor; provide economically the adequate switching needed to match adequate wiring; and give contractor an opportunity to "sell up."**



**Comparative costs on small houses for conventional versus remote control may not differ much, but on larger jobs the simpler installation of switch rings and #18 wire show substantial savings.**



**This outlet near floor is to be controlled from several switch points. The low voltage wiring connected to the relay at left is stapled loosely to studs. Each switch is picked up by looping.**

firm: "In general, 3-way and 4-way control provided by the simple all-purpose switch in low voltage systems is relatively inexpensive by comparison with conventional wiring, which means that such control can be used extensively while keeping within the job's planned cost.

"Basically, it costs more to operate one light with one switch on low voltage circuitry than it does via ordinary wiring. But where a number of 3-ways and 4-ways are required, the resulting economies inherent in low voltage can be most significant.

### Opportunity to "sell up"

"We believe that the contractor achieves no appreciable cost saving until he gets into the wiring of houses in the $25,000 bracket. In any smaller house, low voltage is more of a luxury or prestige item, and it does give the contractor an opportunity to 'sell up' and thus produce an extra margin of profit. Of course, in the case of the more expensive homes, low voltage switching is definitely a profit opportunity that needs exploring.

"Since it benefits the general building contractor, he should be the prime contact by the electrical contractor, and it is most important to reach him or the architect before the job gets under way.

"The low voltage remote control market is certainly improving for the contractor who takes time out to understand the wiring and do an aggressive sales job. After all, the controls are not new; it's only their application that is new."

Mr. Brumbaugh feels that the electrical contractor is rightly his customer's advisor, and he should come up with a better and more adequate installation than his client envisions. In his advisory capacity, the contractor can "sell" by suggesting the convenience and flexibility of low voltage, and thus fire the customer's imagination with its possibilities.

"To properly build up any sizable business on low voltage," says Engineer Brumbaugh, "you've got to educate the general contractor and architect on its manifold selling points in merchandising the homes they produce. The builder is interested in any idea that will help him sell his houses, and certainly low voltage systems lend a prestige the general contractor can ill afford to bypass.

## Bulletins on remote control

Readers are invited to use the postage-paid inquiry card on page 20-A to obtain copies of any or all of the following bulletins, manuals, and catalogs on low voltage remote control switching devices:

| | |
|---|---|
| **Bryant Low Voltage Multi-Control Wiring System Manual** | **Write in S-401** |
| **General Electric Technician's Manual on Remote Control Wiring** | **Write in S-402** |
| **General Electric Catalog of Remote Control Wiring Components** | **Write in S-403** |
| **G-E Bulletin "How Modern Wiring Helps Sell Houses Fast"** | **Write in S-404** |
| **Remcon Electricians' Manual on Remote Control Switching** | **Write in S-405** |
| **Remcon Catalog of Remote Control Switching Components** | **Write in S-406** |
| **Remcon Reprints of Remote Control Switching Applications** | **Write in S-407** |
| **Touchplate's Selected Literature on Remote Control Switching** | **Write in S-408** |

"So far as the architect is concerned, he should be alerted to the system's safety and convenience characteristics for his client, especially since the electrical contractor is often the architect's electrical adviser.

"Certainly, a master switch in a bedroom to turn on some inside and outside lights is a potent selling tool for the builder, and a safety feature of great value in the consideration of the architect for his client."

### Cost comparisons

The Whelchel firm feels that for an equal number of points of control, the cost of low voltage control against conventional wiring is about the same—so are profits. But there may be a wide divergence here when it comes to master control or the fitting of wiring in and around cramped structural areas. A recent Whelchel job of wiring a modernistic home involved the combination of low voltage control with dimming.

Baccus Electric's Hank Gay says: "Low voltage control is significantly less costly when it comes to operating a group of floodlights from several points. Why use #12 wire when you can use #18?" he asks. "There's scant economy or profit in low voltage applications up to the $12,000 house. The contractors who build such homes on speculation are poor prospects for a sales spiel on the extra features of a low voltage job. We figure that a low voltage installation on homes below $12,000 costs about 10 per cent more than conventional wiring. But in the larger homes we wire, the cost for low voltage is from 10 to 20 per cent lower."

From Sarasota's Terrell Electric comes the statement: "We feel low voltage control is unjustified in a home costing less than $10,000. But in larger houses, the saving resulting from the use of low voltage switching as compared with conventional switching mounts very rapidly if the conventional switching is to utilize mercury switches for example. Some idea of the savings is obtained by comparing the cost of a low voltage switch at 50 or 55 cents with a 3-way mercury switch at $1.98 or a 4-way at $3.96; or 2-wire Romex with ground at $40.70 per 1,000 ft., against 3-conductor #18 or #20 at a little more than half that price. Installation cost is also a factor in favor of low voltage wiring.

"Our experience indicates that significant profits in favor of low voltage remote control wiring emerge in the wiring of a spacious home. The larger the house the more money in it; and with each job, you learn to speed up and make more of a profit. Besides, by becoming a specialist in low voltage, you have something different to offer your customers over and above run-of-the-mill installations; you can use it as the jumping off point to get away from no-profit competitive bidding on low priced residences, and thus

*(Continued on page 132)*

## NEW BULLDOG XL BUSTRIBUTION DUCT...

# 3 WAYS SAFER FOR PEOPLE AND PROPERTY

HERE'S THE FIRST DEAD-FRONT plug-in duct. Butyl insulation covers the full length of each silvered aluminum bus bar, *even in bus plug openings*. Personnel are positively protected against accidental contact with "live" bars.

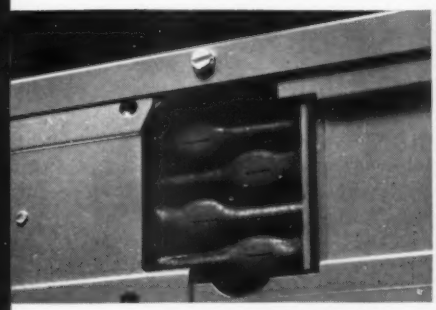
PLUG-IN SAFETY DOOR IS ALWAYS CLOSED during installation of XL Safety Plug. Interlock finger positively prevents plug installation or removal when Safety Door is open . . . and it keeps door from closing against "live" plug fingers.

THERE'S NO ARCING to endanger people or property . . . you can't plug in or unplug when the switch is "ON."

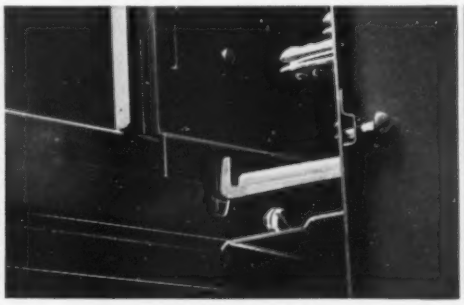
New XL BUStribution® Duct cuts down installation time . . . takes less space . . . reduces duct weight on building structure as much as 40%. Keyed bus ends slip together in a hurry while a single integral bolt locks joints securely under a ton of pressure.

Ask your BullDog representative to arrange for a demonstration. You'll see how safe and fast-to-install XL BUStribution Duct and matching Safety Plugs really are!

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Michigan. In Canada: 80 Clayson Rd., Toronto, Ont. Export Division: 13 East 40th St., New York 16, N. Y.



IT'S TRUE DEAD-FRONT. Each silvered aluminum bus bar is full-length insulated with Butyl envelope.



IT'S A SAFETY DOOR. You can't plug in or unplug with the door open, can't close door on "live" plug fingers.

IT'S A SAFETY PLUG. You can't plug in or unplug against a load . . . safeguards personnel and equipment against arcing.

*Consult the following Southern representatives:*

**Wilson Electrical Equipment Co.**
3210 Garrow St., P.O. Box 1725
Houston, Texas

**Wilson Electrical Equipment Co.**
101 E. Maple Street
San Antonio, Texas

**Standard Electric Mfg. Company**
2401 Federal St., P.O. Box 1138
Dallas 1, Texas

**Walker Electrical Co., Inc.**
125 Bennett St., N.W., P.O. Box 2308, Station D
Atlanta, Georgia

**BULLDOG ELECTRIC PRODUCTS DIVISION**
**I-T-E CIRCUIT BREAKER COMPANY**

KEEP PACE WITH ELECTRICITY

# Rigid PVC plastic conduit use increasing rapidly in Florida

**This article should be especially helpful to the following readers:**

- Electrical Contractors
- Electric Utilities
- Electrical Wholesalers
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

◆ RIGID PVC (polyvinyl chloride) pipe has already proved itself through years of service as a superior piping material for handling the most corrosive chemicals. Many of these same advantages make it an excellent and economical conduit for electrical systems.

While there are indications that PVC rigid conduit will prove useful for many types of electrical conduit installations, its resistance to corrosion has made it particularly well suited for use in coastal areas where corrosion has been a troublesome problem.

Rigid plastic conduit is still a relatively small percentage of total conduit sales, but use is increasing rapidly in certain applications. For example, in Florida PVC is now the only raceway being used in bridge work. Wide application is being made of PVC rigid conduit in wiring for swimming pool lighting, pool decks, pump rooms, underground branch circuits located in open ocean-front public areas, garden and shrubbery lighting, and dock wiring.

Electrical raceway of PVC type is being approved for underground and slab work applications in the City of North Miami. That city is also approving some applications around the water front, but these are approved only by special permission in each instance.

Similiar approval by special permission is being given for PVC rigid conduit installations in Tampa, Orlando, and Manatee County areas.

Another interesting Florida installation was completed recently by a Brandon, Fla., electrical contractor, H. B. Mahlin in connection with a caution signal at a railroad crossing. This job utilized PVC high impact rigid conduit and fittings for a raceway containing railway signal circuits. It had to be "jetted" under the railway road bed (water under pressure used to tunnel conduit passageway under railroad) and withstand the con-

*(Continued on page 132)*

**Information and photographs for this article were supplied by Raybro Electric Supplies, Inc., Tampa, Fla., and B. F. Goodrich Co.**

**These pictures demonstrate the simplicity of making joints in plastic conduit runs. First step is to clean off conduit and socket fitting. Next, apply solvent cement; then slip conduit into fitting. Conduit can be easily bent by wrapping bent section with aluminum foil and heating with low-pressure butane torch.**

**Mahlin Electric Co., Brandon, Fla., recently completed one of the many installations in Florida for which plastic conduit is well suited. This job involved an underground circuit for caution signals at a railroad crossing. Here H. B. Mahlin has laid out the plastic conduit line; next, applies water pressure for jetting the raceway under the road bed; and gets results as shown in break through at right.**

*The shape of things to come from BullDog*

*Watch for the introduction of our new Duplex Pushmatic®*
*. . . another product for better electrical living!*

**BULLDOG ELECTRIC PRODUCTS DIVISION**
**I-T-E CIRCUIT BREAKER COMPANY**

# Dallas readies for NAED meeting

◆ FOR THE FIRST TIME in the 52-year-old history of the National Association of Electrical Distributors, the organization's national convention will be held in Texas. Dallas is the city selected to host an estimated 3,000 NAED members and guests during the four-day meeting, May 1 to 4.

Theme of the convention will remain the same as that of the 1959 convention in Chicago, "Let's Make Some Money."

A local Dallas-Ft. Worth Convention Committee, composed of representatives of electrical supply companies in the two cities, are working together to make certain that the 1960 NAED convention will be the best attended and the most memorable in the association's history.

Headquarters hotel will be the Adolphus in Dallas, closest to the Memorial Auditorium, which is the site of the business sessions and conference booths. Reports are that 200 or more manufacturers will have conference booths at the convention this year.

A reception committee made up of members and officers of local supply companies will be on hand to greet incoming NAED members and their wives at Love Field and the union station. The committee will be at these two major transportation centers on April 30 and May 1.

"We are going to do everything possible," said Austin Watson, chairman of the local convention committee, "to make every visitor to the convention feel welcome."

Pre-registration figures indicate that a record attendance is in prospect for the four-day meeting. The Dallas Chamber of Commerce housing bureau reported that as early as the end of February, more than 1,600 reservations had been confirmed for Dallas hotel rooms. Another early report from convention officials revealed that more than 400 wives of NAED members have made plans to attend the meeting. This figure is far higher at this early date than ever previously recorded.

Watson has also said that the outstanding entertainment event for visiting conventioneers will be the Jim Shoulders Rodeo on the evening of May 3, at 8:30 p.m. Shoulders, all-around world's champion cowboy, said the event is recognized by the Rodeo Cowboy's Association as an official rodeo and earnings on the part of the contestants will count toward the cowboy's total score for the year, helping him qualify for the World's Rodeo Finals. Over $4,000 in prize money will be given the rodeo contestants.

Tickets to the rodeo will be made available to NAED members and guests through a number of leading electrical manufacturers, co-sponsors of the event. Extra tickets will be given to orphanage homes in and near Ft. Worth and Dallas, according to local convention committee spokesmen, since they intend that every seat in the new 7,200 capacity multi-million dollar coliseum is filled on the night of the performance.

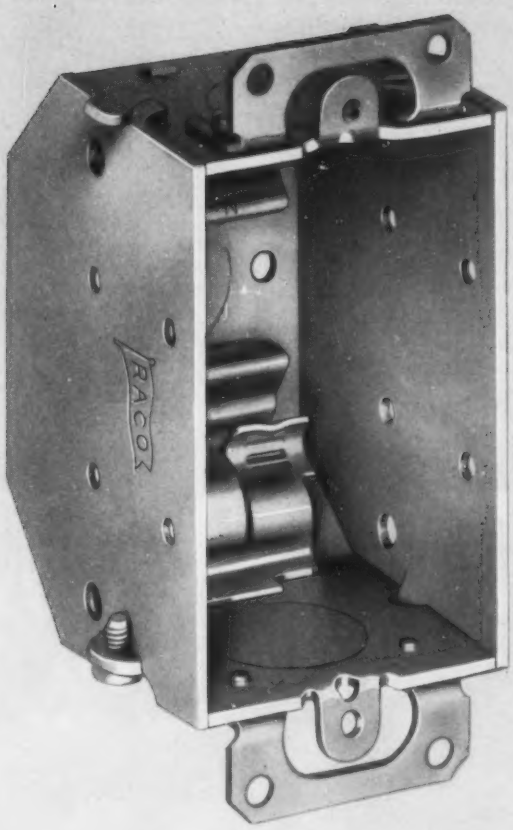
The local convention committee has also asked manufacturers to not schedule conflicting activities on the night of Tuesday, May 3, at the convention so that all will

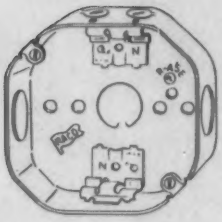
*(Continued on page 132)*

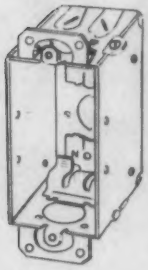
**Dazzling skyline of Dallas showing the Memorial Auditorium in the foreground, site of NAED business session and conference booths.**

**Members of the local NAED Convention Committee, who are making plans for the 52nd annual convention in Dallas, May 1 to 4, 1960**

**Standing, left to right: Percy Rawlinson, Rawlinson Electric Supply Co.; Sam Johnson, General Electric Supply Co.; Jack West, General Electric Supply Co.; Cecil Ross, Graybar Electric Co.; Austin B. Watson, Watson Electric Supply Co., chairman; and M. F. Baldwin, Southwest Electrical. Seated: James Morrow, Smith Perry Electric Co.; Alex Meletio, Meletio Electric Co.; A. P. Hammerstrom, Westinghouse Electric Supply Co.; and Vic Elmblad, Graybar Electric Co. Other members not in picture: E. C. Cummins, Cummins Supply Co.; J. D. Craig, General Industrial Supply Co.; Nathan Frankel, Frankel Electric Supply Co.; Clifford Robinson, Electrical Supply Co.; and Earl Summers, Summers Electric Co.**



RACO switch and outlet boxes also available with "Q" Quick-Clamps.

# New RACO "Q"* Quick-Clamp now available in Beveled Corner boxes

RACO's revolutionary new "Q" Quick-Clamp that lets you install non-metallic sheathed cable in seconds . . . with no screws to tighten . . . is now available in complete line of RACO beveled corner boxes, too!

The new "Q*"s Quick-Clamp for beveled corner boxes has the same time and money saving advantages as the original "Q" Quick-Clamp introduced last year:

1. Simply push cable into "Q" Quick-Clamp . . . no screws to tighten . . . no threads to strip.
2. Pull cable into clamp to any length desired.
3. To back cable out of clamp, or to shorten your lead, apply a little pressure under clamp with a screwdriver and pull cable back.

The new "Q" Quick-Clamp grips cable tightly . . . it can't be pulled out . . . exceeds Underwriter Laboratories' tests (fully protected by patents). Get the new "Q" Quick-Clamp switch and outlet boxes now at your RACO Distributor.

*T.M.

Cable moves freely into clamp and is tightly gripped.

To back-off cable, release clamp pressure with screwdriver.

RACO

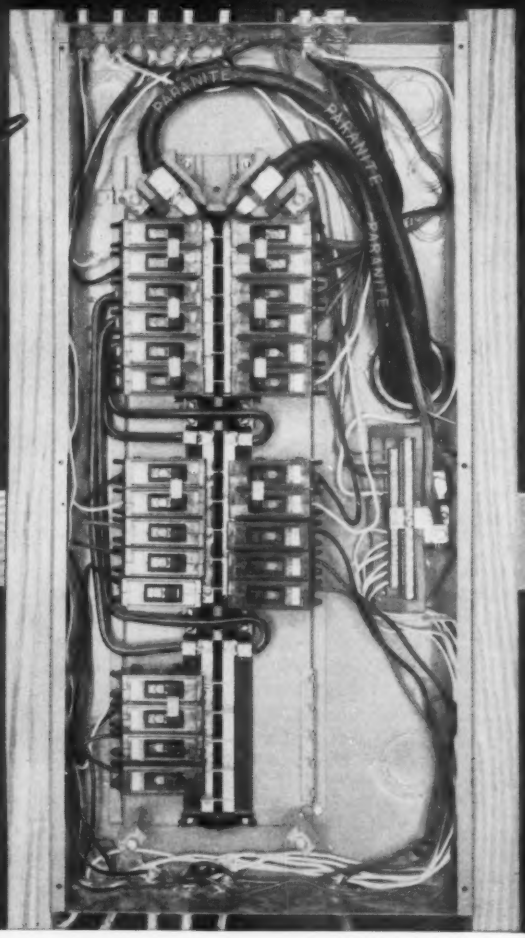
**ALL-STEEL EQUIPMENT INC.**
AURORA, ILLINOIS

**You can break the high installation cost barrier at the jobsite with...**

# PROFIT PACER

KEEP PACE WITH ELECTRICITY

BUILDING WIRES



For years Paranite has concentrated on the production of quality wire products with features that permit time-saving installation efficiencies! Men on the job know that Paranite strips fast! Paranite construction from skin to core pays off in easier handling! Slick finishes for smooth pulling . . . and dead-soft conductors give desired flexibility for working through studs or in conduit. The full line of Paranite products are in labor-saving packages, with color-coded labels for instant identification. And most important, you pay no more for proven-quality Paranite!

# PARANITE®

## AND CABLE

A.

B.

**A.** Parasyn® Type THW Thermoplastic insulated 600 V building wire is UL listed 75°C for wet or dry application. Small diameter, slick silicone finish, color availability and stripping ease assure reduced handling costs. Solid and stranded, 14 AWG through 500 MCM.

**B.** Paranite Service entrance cable for 75°C wet or dry application available in armored and unarmored, copper or aluminum. Weather resistant construction contributes to long life and reliability of service. Special formulation provides non-bleeding characteristics when in contact with painted surfaces.

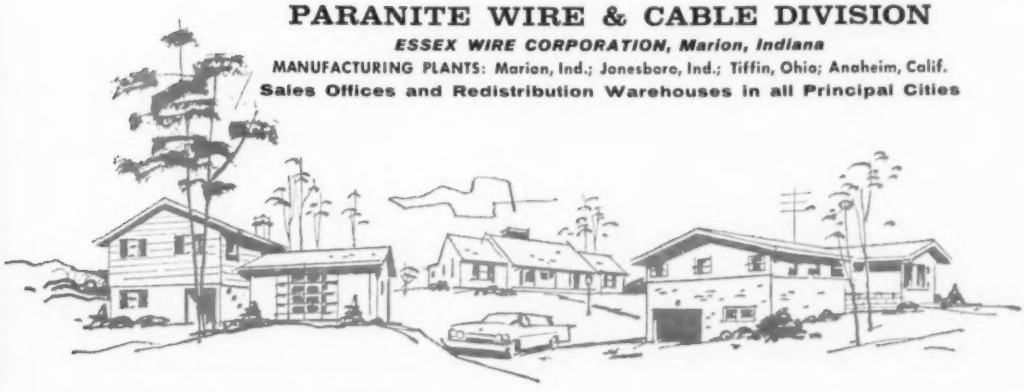
*Paranite wire products are readily available from leading distributors across the nation in a full range of sizes and conductors, both copper and aluminum.*

**PARANITE WIRE & CABLE DIVISION**

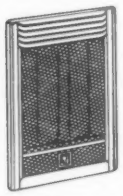
***ESSEX WIRE CORPORATION, Marion, Indiana***

**MANUFACTURING PLANTS: Marion, Ind.; Jonesboro, Ind.; Tiffin, Ohio; Anaheim, Calif.**

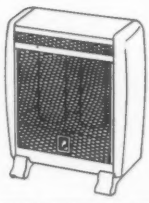
**Sales Offices and Redistribution Warehouses in all Principal Cities**



"TWIN-FIN" ELECTRIC BASEBOARDS



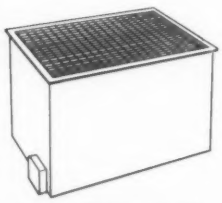
ELECTRIC WALL HEATERS



ELECTRIC PORTABLE HEATERS

ELECTRIC BATH HEATERS

ELECTRIC CEILING CABLE



ELECTRIC FLOOR FURNACES

# When Electric Wall Heaters Are Indicated, Be Sure - Make Them MARTIN

Like all Martin electric heat products, Martin Automatic Wall Heaters are backed by 55 years of experience in the heating field. They are engineered for long life and trouble-free operation. These Martin features do more than sell. They insure continued customer satisfaction throughout years of continued use.

- **Warm Air Control:** Air Guide Louvers direct dust-laden hot air away from walls.
- **No Moving Parts:** Ceramic chimneys move warm air quietly throughout the living area.
- **Single Knob Control:** Combination switch and thermostat is easier to adjust and more sensitive to temperature changes.
- **Safer, More Attractive:** Martin's exclusive Safety Mesh Golden Grille blends with room furnishings, excludes small fingers, even small objects.
- **Easier Cleaning:** Grille is removed by loosening two thumb latches.
- **10-Year Guarantee:** Heating element guaranteed for 10 years against burn-out.

***Be ready for the coming expansion in electric heat. Sell Martin, the Leadership Line of Electric Heat Products. Catalogue and complete details on request.***

See the entire Martin line in Booth 207 at the National Electric Heating Exposition.

**MARTIN**

**STAMPING & STOVE COMPANY**

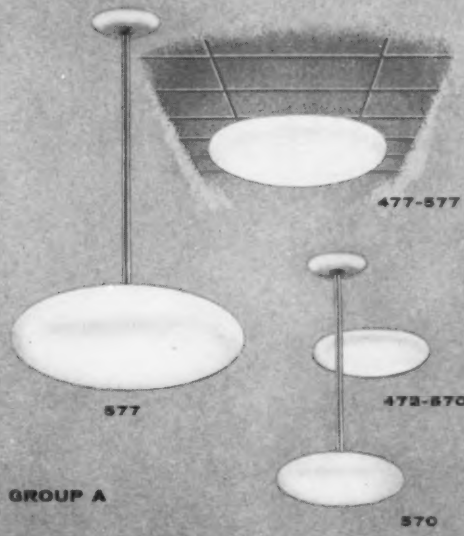
HUNTSVILLE, ALABAMA

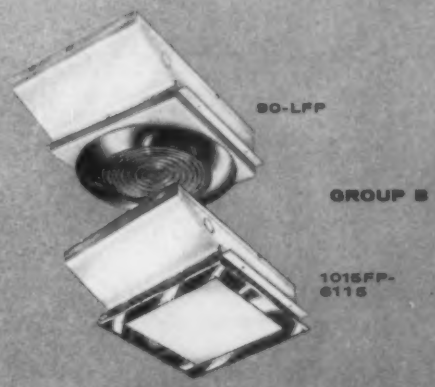
AMERICA'S MOST COMPLETE HEATING LINE

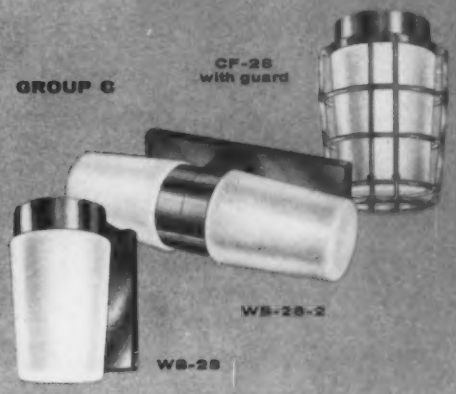
A Few Lighting Fixtures from the **PRESCOLITE** *NEW PRODUCT PARADE*

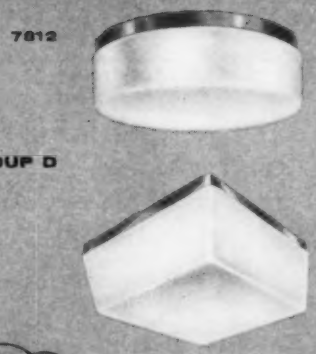
Group "A" "Satellite"—a new departure in beautiful, hand blown "Thermopal" glass used with pendant fixtures or on recessed housings.

Group "B" A new concept in recessed lighting for specific use in concrete construction.






Group "C" The original weather proof, "Dielux" diecast aluminum bracket and ceiling lights now in 150-200 watt sizes. Hand blown "Thermopal" glass. Available with diecast aluminum guard.

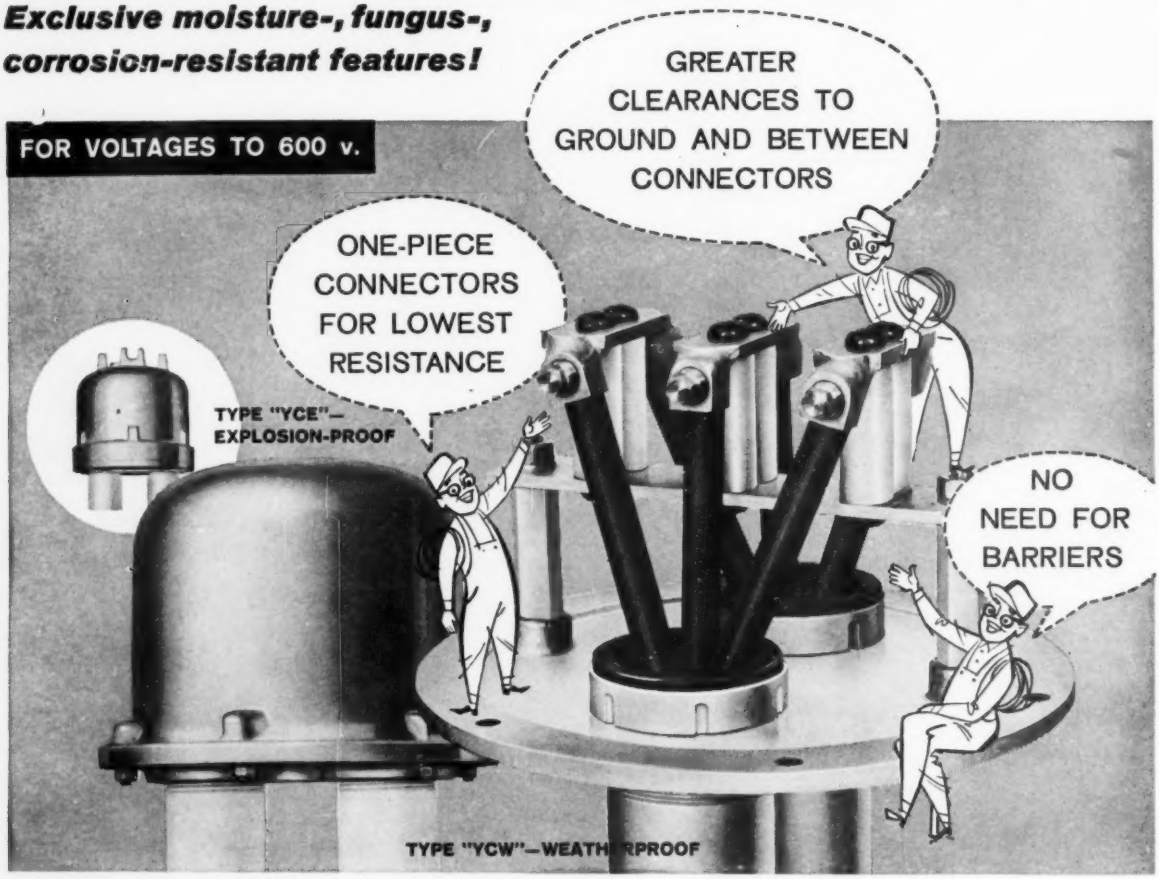
Group "D" Round and Square Drum fixtures with hinged "Dielux" diecast canopy. Hand blown "Thermopal" glass.

*Write for more complete information.*

**PRESCOLITE MFG. CORP.**, 2229 Fourth St., Berkeley, Calif.
FACTORIES: Berkeley, Calif. • Neshaminy, Pa. • El Dorado, Ark.

# NEW! O.Z. PULL-N-SPLICE BOXES!
# CONVENIENT·COMPACT·ECONOMICAL

***Exclusive moisture-, fungus-, corrosion-resistant features!***


FOR VOLTAGES TO 600 v.
GREATER CLEARANCES TO GROUND AND BETWEEN CONNECTORS
ONE-PIECE CONNECTORS FOR LOWEST RESISTANCE
TYPE "YCE"— EXPLOSION-PROOF
NO NEED FOR BARRIERS
TYPE "YCW"—WEATHERPROOF

O.Z. Pull-n-Splice Boxes mark a significant advance in pull box construction!

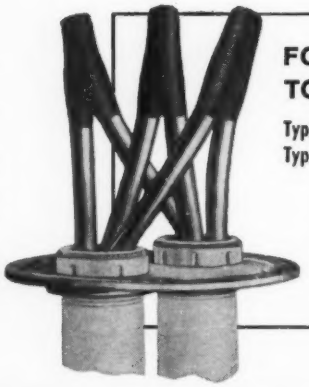
Their highly compact size saves *more space than ever!*

Their more efficient design means *new savings in installation time and labor!*

Their moisture-, fungus-, and corrosion-resistant features mean long, trouble-free service.

Still, with all their features, the new O.Z. Pull-n-Splice Boxes are *smaller* — and *cost far less* than conventional pull boxes . . . even late model *competitive* types! And, you get a bonus in high quality materials and workmanship so characteristic of *all* O.Z. products!

For complete information on these and the many other O.Z. products that mean more for you, call your local O.Z. distributor, or write to the company.



**FOR VOLTAGES TO 5000 v.**

Type "YPW" — Weatherproof
Type "YPE" — Explosion-proof

Deeper dome than "YCW" and "YCE". Furnished without connector panels. Insulated pigtail splices recommended.

**O.Z.** ELECTRICAL MANUFACTURING CO., INC.
262 BOND STREET • BROOKLYN 17, N. Y.

- CAST IRON BOXES
- CABLE TERMINATORS
- POWER CONNECTORS
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# *New* ORANGEBURG® CA* CONDUIT *with Flush Coupling Attached!*

With no separate couplings to handle or attach on the job, Orangeburg CA lays faster, costs less to install. Each long, light length has a *flush* coupling attached at one end and a standard 2° male taper at the other end, making installation a simple, one-step operation. And, since the coupling *is* attached, there are no coupling cartons to warehouse or carry to the job.

What's more, with the coupling *flush* to the conduit's outside wall, new CA is easy to stack, store and handle. The flush coupling also eliminates "staggered" joints in the trench. And that means real savings in cutting and tooling time.

Like the hundreds of millions of feet of Orangeburg fibre conduit in use since 1893, new CA has self-sealing joints and impermeable walls. Its smooth, 100% fibre raceway adds years to cable life.

New Orangeburg CA is available in 2", 3", 3½", 4", 4½" and 5" sizes. Orangeburg Standard and Nocrete Conduit, with separate sleeve couplings, are available as always. Write Dept. ES-40 for Catalog 52.

ORANGEBURG MANUFACTURING CO.
Orangeburg, New York

*Division of The Flintkote Company, Manufacturer of America's Broadest Line of Building Products*

FLINTKOTE

*Orangeburg Fibre Conduit is distributed by Graybar Electric Co. and General Electric Supply Co. with branches and stocks in principal cities.*

# Same box - 8 extra circuits

**General Electric TRM1210S "twin"* load center** wired with two double-pole TQL plug-in breakers and eight single-pole plug-in TQL's.

**Same load center** wired with two double-pole TQL's and *sixteen* General Electric Type TR "twins" — two rugged breakers in a one-inch case.

## Install more circuits, buy a less expensive box, with

## General Electric "twin" circuit breakers

NEW

**70 and 100-amp plug-in breakers**

Perfect for sub-feed panels or main disconnects (back-fed). Protected female stab receptacles grip tightly; can't bend; plug-in without jiggling. All current-carrying parts silver-plated for cool, safe operation.

The "twin" lets you put up to twice as many circuits in the same space—because the "twin" is actually *two* rugged plug-in breakers in a single one-inch case.

Combined with other top-quality G-E breakers, the "twin" gives you complete flexibility in circuit arrangements. It is interchangeable with General Electric Type TQL single-pole and 2- and 3-pole common-trip breakers. Ask your G-E Distributor to show you how General Electric's "twin" can save you money on your next job.

*Trade-Mark

PROTECTING MEDALLION HOMES
EQUIPPED BY GENERAL ELECTRIC

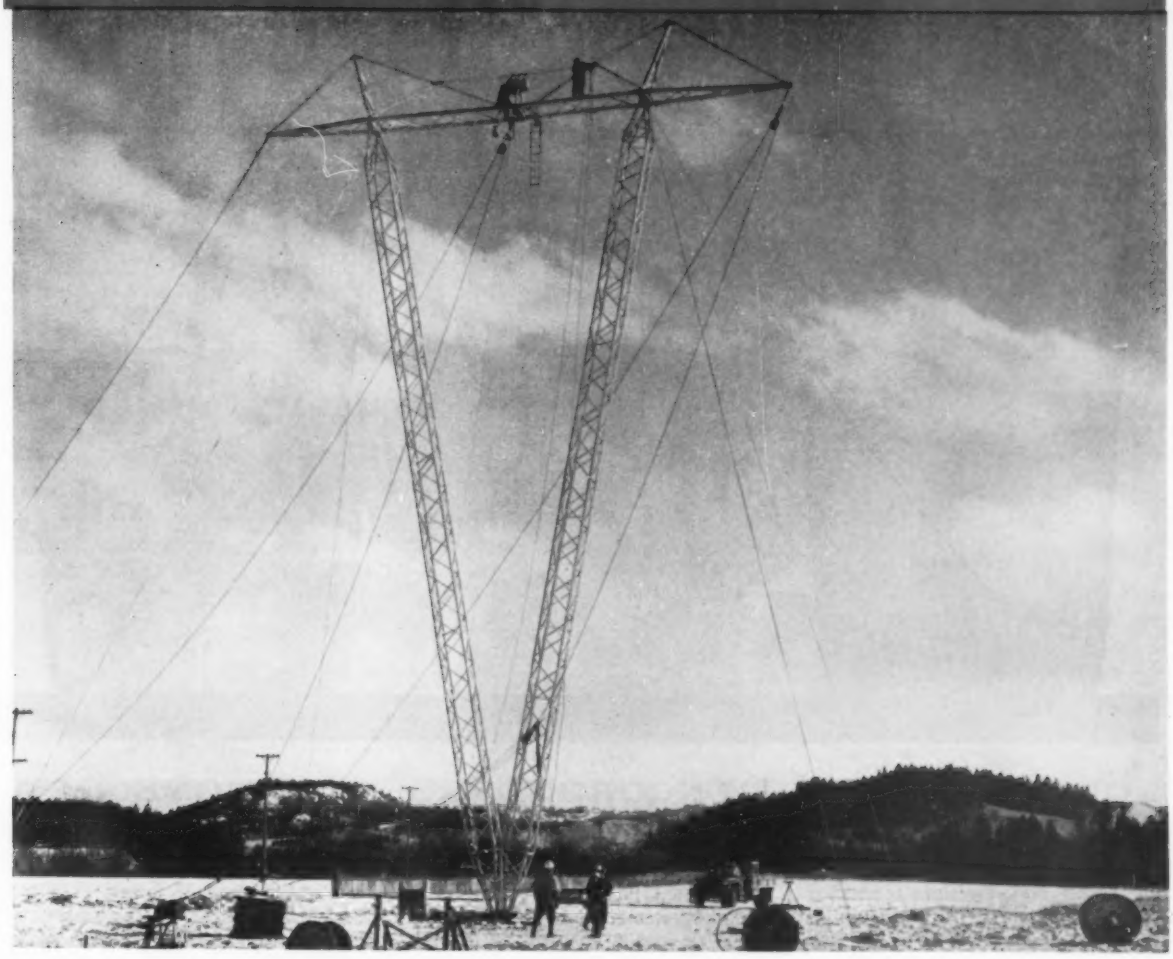
GENERAL ELECTRIC

# UTILITY ENGINEERING

Transmission — Distribution — Metering

Design
Installation

Testing
Maintenance

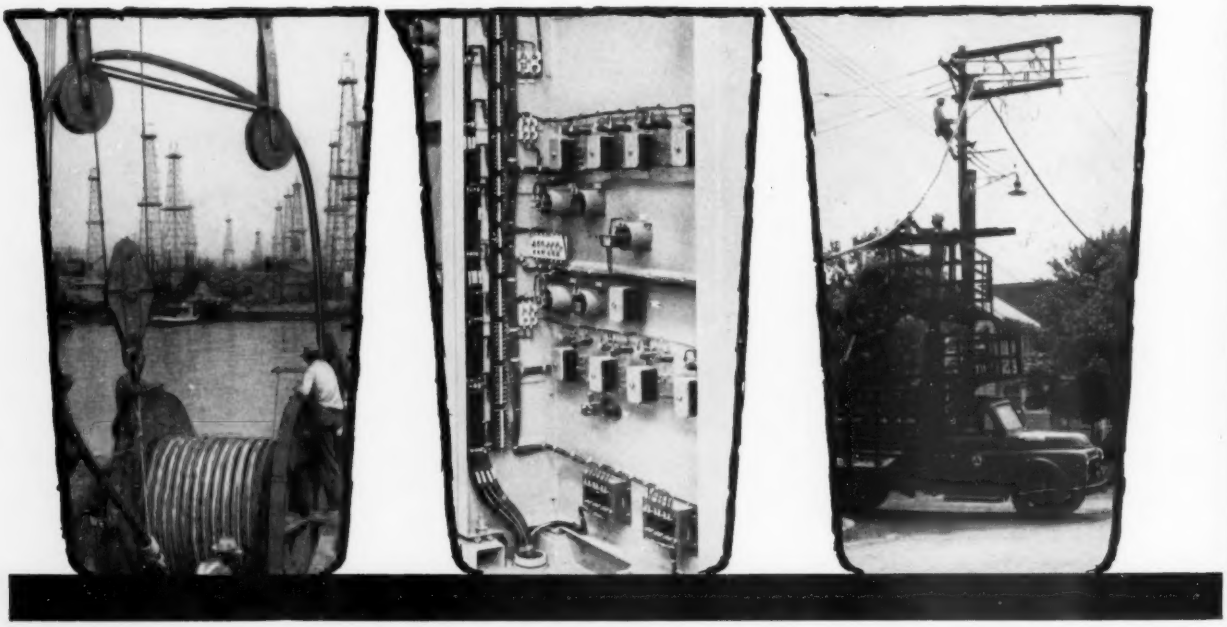


**Recent development in structures for transmission and substations—page 70**


**Transmission tower design follows European practice—page 70**
**Economies achieved in river crossing towers—page 72**
**Prefab substation put up in 48 minutes—page 74**
**Conductor heat dissipation data - Part 2—page 76**
**Labor unit data for outside electrical construction - Part 2—page 80**
**New device for high voltage switching—page 84**

from the
laboratories of
General Cable...

# PREMIUM QUALITY INSULATION COMPOUNDS



## AQUASEAL

low SIC, superior, rubber compound that is heat and water resistant, used on single and multiple-conductor cables at ratings up to and including 2KV a-c or d-c. Recommended for dry, alternately wet and dry, and continuously wet locations, subject to a-c or d-c potentials at either polarity, and at a maximum conductor temperature of 75C.

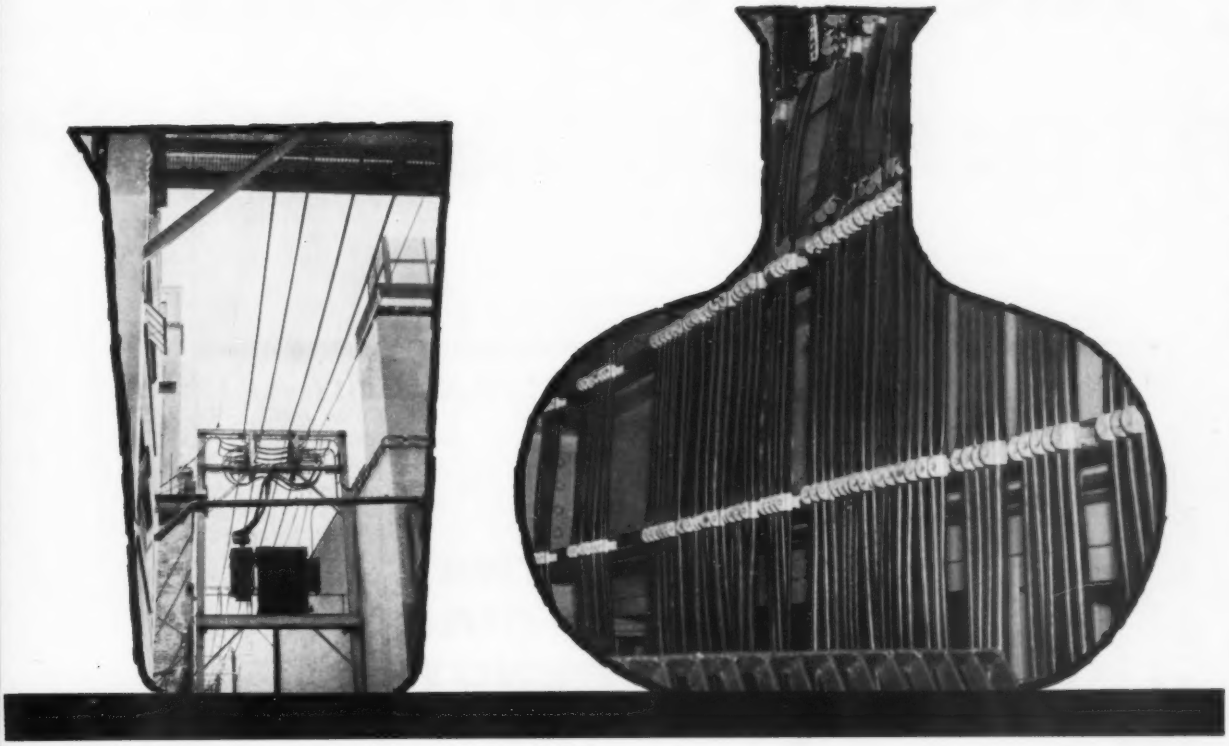
## GENCORONE

high-voltage, ozone-resistant insulation of the oil base type, with exceptional physical and electrical stability. Resists the effects of moisture, sunlight, weather and earth solutions. Permits liberal current ratings consistent with maximum continuous operating temperatures of 75C for 8KV service or lower and 70C for higher voltages.

## BUTARONE

high-voltage, butyl-base compound with exceptional resistance to ozone, low water absorption, and excellent resistance to heat. Suitable for both low and high-voltage applications, it has excellent electrical stability and resistance to aging. Operates at 90C up to 5KV and at 85C at higher voltages.

**In the modern General Cable laboratories,** some of America's foremost rubber chemists create, test and evaluate new insulation compounds in a continuous program of research and development. Materials for standard service conditions and special constructions to satisfy unusual requirements have all proven their worth in superior performance in power and control cables over many years. A few of the basic compounds from General Cable's long list are briefly described on these pages.



## THERMAX-W

and many other compounds in the rubber group are available for low and moderate voltage power cable service in wet locations, where high temperatures are encountered or where high current carrying capacity is required.

## GENCASEAL (PVC)

in the thermoplastic group, as well as high-molecular-weight polyethylene, which is another outstanding General Cable thermoplastic insulation.

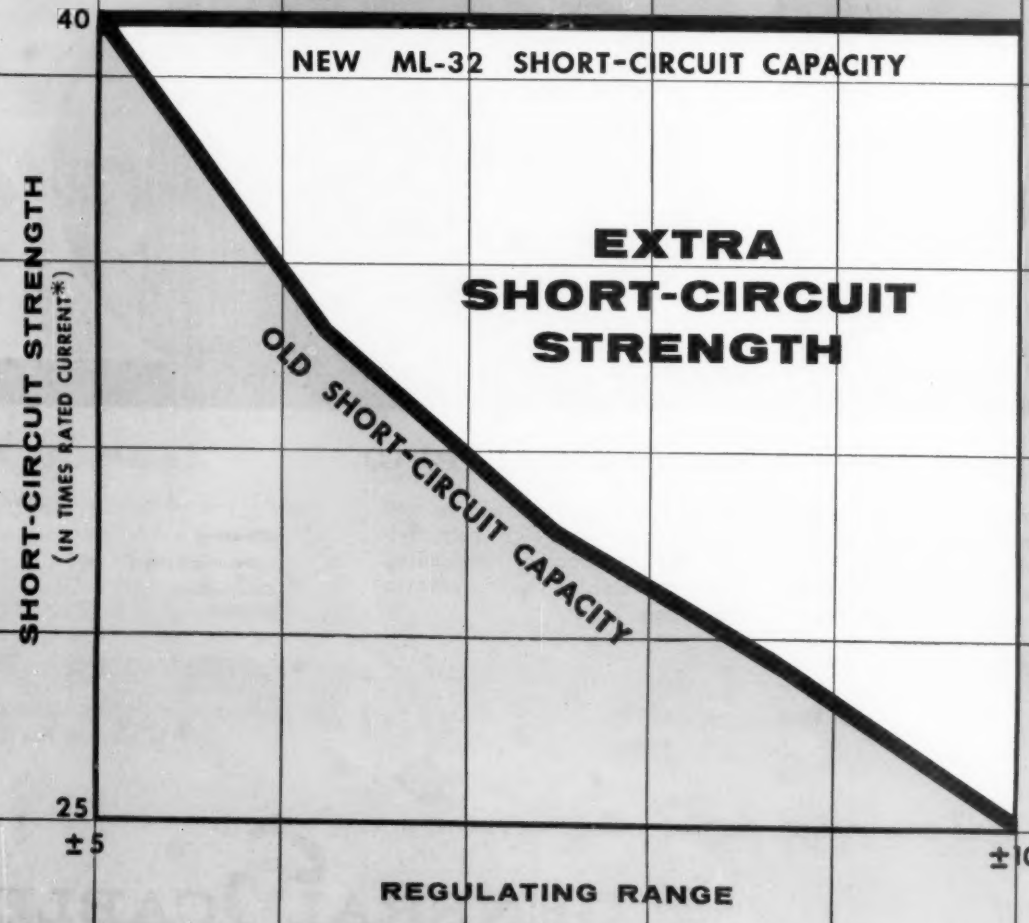
*Offices and Distributing Centers Coast-to-Coast*

GENERAL CABLE CORPORATION, 730 Third Avenue, New York 17, N. Y.

*for quality and service specify...* GENERAL CABLE

NOW STANDARD ON ALL GENERAL ELECTRIC

# 40 times rated current* short-




* *Rated current is the nameplate current at ±10% regulation.*

## SINGLE-PHASE STEP VOLTAGE REGULATORS

# circuit strength

New, stronger coil windings of General Electric single-phase ML-32 step voltage regulators will now withstand short-circuit currents of 40-times basic nameplate rating (the basic current rating at ±10% regulation) at all Load Bonus positions.

This increased short-circuit capacity is available for a duration of 0.8 seconds (48 cycles). With modern breakers, this time period gives ample leeway to detect a fault and de-energize the circuit.

Additional strength to resist high-current forces means increased protection against service outage under all current loads, plus even longer dependable life for already superior General Electric voltage regulators. Both of these important benefits are now available in G-E regulators at no increase in price.

These service extras are now possible because of the following G-E design improvements:

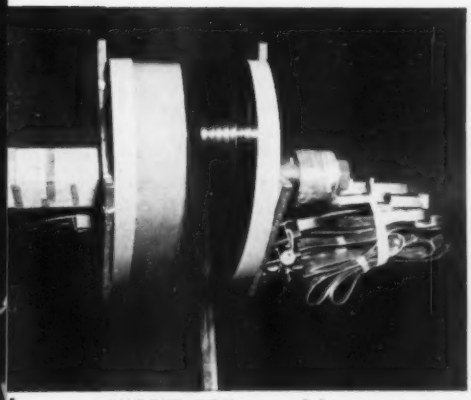
- **TIGHTER WINDINGS**—new coil winding process provides tighter, even coils; inherently stronger, better able to resist coil movement caused by short-circuit stresses.
- **SPECIAL INSULATION**—specially treated layer insulation forms a stronger winding-to-winding bond for finished coil. Additional protection added at points of most-severe stress to further resist coil shifting.
- **CONTROLLED DUCT SPACING**—cooling duct spacers are accurately positioned to hold windings firmly in place against radial forces during short circuits.
- **BALANCED WINDINGS**—coils are precisely aligned to resist destructive forces caused by short circuits.

This new high standard for voltage regulators is another dividend you receive from G-E research.

To learn more about all the reasons why G-E Voltage Regulators Cost Less on the Line, contact your nearby General Electric Apparatus Sales Office or Agent. Or write for Bulletin GED-3905, General Electric Company, Section 423-41, Schenectady 5, N. Y.

*Progress Is Our Most Important Product*

GENERAL ELECTRIC



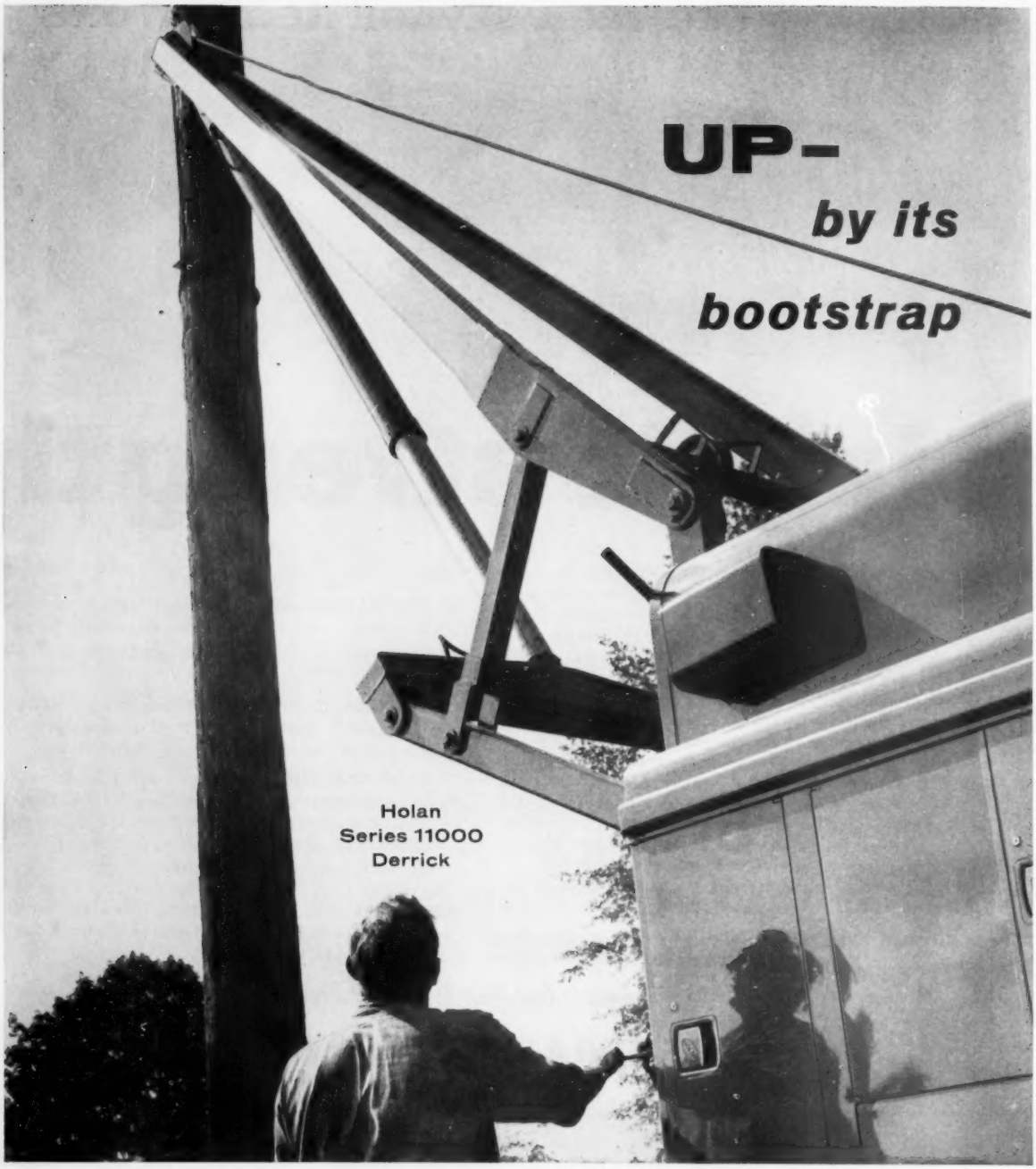
**RUGGED COIL** wound by new process provides stronger resistance to forces caused by high short-circuit current.

**SPECIAL INSULATION** strengthens coil by stronger winding-to-winding bond, resists movement caused by short-circuit currents.

**EXTRA REGULATOR STRENGTH**

**(for a typical ML-32 100-ampere unit)**

| Regulating Range | Current Range | Former Short-circuit Capacity | NEW Short-circuit Capacity |
|---|---|---|---|
| ±10% | 100 amp (normal) | 2500 amp | 4000 amp |
| ±8¾% | 110 amp (load bonus) | 2750 amp | 4000 amp |
| ±7½% | 120 amp (load bonus) | 3000 amp | 4000 amp |
| ±6¼% | 135 amp (load bonus) | 3375 amp | 4000 amp |
| ±5% | 160 amp (load bonus) | 4000 amp | 4000 amp |




Secret of this single-cylinder derrick is its bootstrap linkage. This unique design feature lowers the cost of this new Holan derrick without lowering the quality.

One rugged hydraulic cylinder—controlled by a single lever—will lift a load of 8,000 pounds, set 60-foot poles, body load 2,000 pounds and lower the derrick to within two feet of the ground.

The Holan Series 11000 Derrick is a fully live boom derrick with two rectangular shaped side legs—fabricated from high tensile steel—pivoted about a rear post with a hydraulic cylinder leg.

Here is a derrick you will want to investigate. Call your Holan Field Representative—or write us for complete details.

Holan Corporation, 4100 West 150th Street, Cleveland 35, Ohio
*Plants in:* Cleveland, Ohio; Griffin, Georgia; Phoenix, Arizona

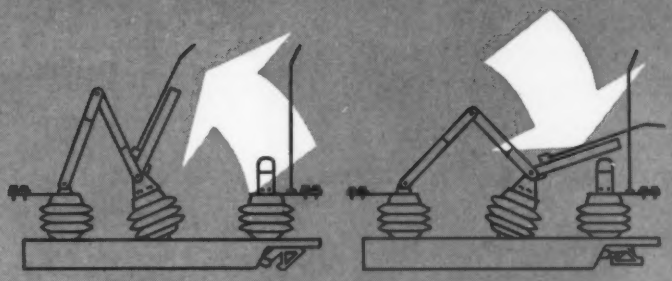
Holan

Subsidiary of THE OHIO BRASS COMPANY

HOLAN

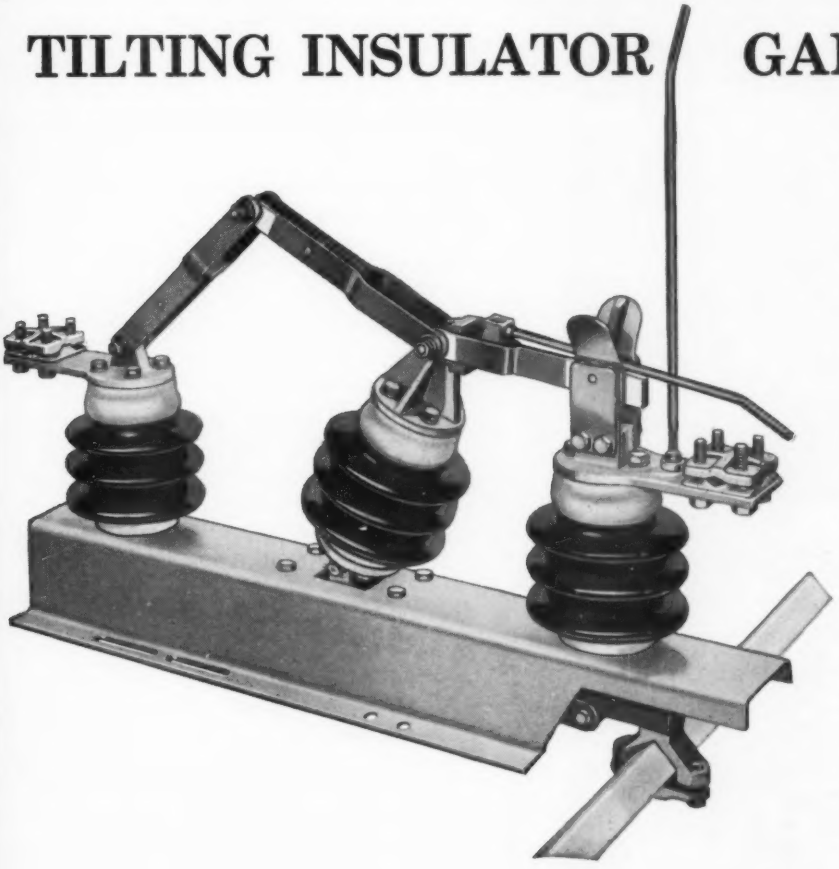
Special **KEARNEY** design for

smooth opening and closing



despite crossarm warpage

# TILTING INSULATOR GANG SWITCH



- Switch works smoothly even when crossarms are warped out of alignment, horizontally or vertically, because the specially designed interphase shaft clamp compensates for any structural distortion
- Double leverage frees switch blade of heavy ice coatings: "pry-out" blade action plus toggle action of operating linkage on the tilting insulator
- Longer maintenance-free service in corrosive atmospheres—and in unusually frequent operation—because there is no flexible blade shunt to wear out
- Extra long jaws: adjustment for blade travel need not be critical . . . silver blade to jaw contacts
- Tilting insulator supported by Oilite bearings
- Easy installation . . . interphase shaft can be lifted into clamps after switch is in position

**JAMES R. KEARNEY CORPORATION**

*General Offices:* 4224-42 Clayton Ave., St. Louis 10, Mo.

-365

for BETTER CONSTRUCTION
SAFER MAINTENANCE

*Specify*

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO. GUELPH, ONT.

*The Mark of Quality*

# KEARNEY PRODUCTS

ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA

## MOLONEY DISTRIBUTION TRANSFORMERS ARE DESIGNED TO MEET ALL SYSTEM REQUIREMENTS

Comparative analysis of distribution transformers invariably leads to one conclusion . . . the best distribution transformer has all characteristics of design carefully developed in respect to their contribution to system efficiency, dependability and economy.

In Moloney Distribution Transformers, no one feature, electrical or mechanical, is radically improved at the expense of another. Instead, each part of the design is carefully considered and balanced with the others, to provide a distribution transformer that will give the best all-around system performance.

Utility systems benefit from this philosophy of design because every Moloney Distribution Transformer feature is designed to perform in the best possible manner compatible with every other aspect of the design, and thus provide "More Power To You."

Desirable Characteristics of Moloney Distribution Transformers Include . . .

| | |
|---|---|
| Low Core Loss | Impulse Strength |
| Low Exciting Current | Low Impedance |
| High Overload Capacity | High Efficiency |

**Here Is How They Are Achieved.**

# SUPERIOR PERFORMANCE BECAUSE...

MOLONEY ELECTRIC CO.

*Since 1896 . . .* ***MORE POWER TO YOU***

## 1 Design

Computers review hundreds of possible designs in a relatively short time, to obtain design parameters which promise to develop into the best all-around distribution transformer design. Design engineers review the computer data. Then guided by Moloney's extensive experience in transformer design and also by utility requirements, they prepare the final design.

## 2 Low Core Loss and Exciting Current

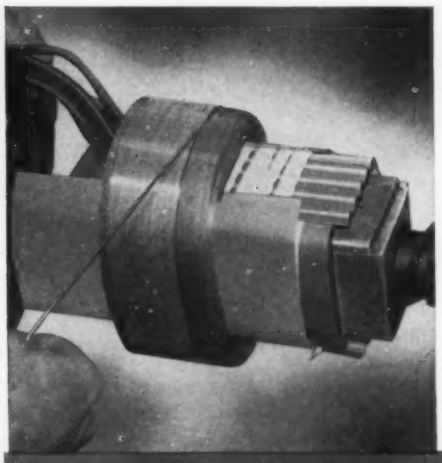
Skillful application of high grade cold rolled grain-oriented silicon steel, carefully handled and annealed, gives low core loss and exciting current. The core design uses one turn laminations with the ends butted one against the other. To minimize the required exciting current, the butt joints are staggered, providing a high permeability path for the flux.

## 3 High Overload Capability

Corrugated pressboard, strategically placed, forms cooling ducts which expose a larger area of the winding surface to the oil, thereby reducing the winding gradient. The result is a lower hottest spot temperature under all conditions of load. Therefore, under conditions of overload, any loss of transformer insulation life is minimized.

ME60-3

SALES OFFICES IN ALL

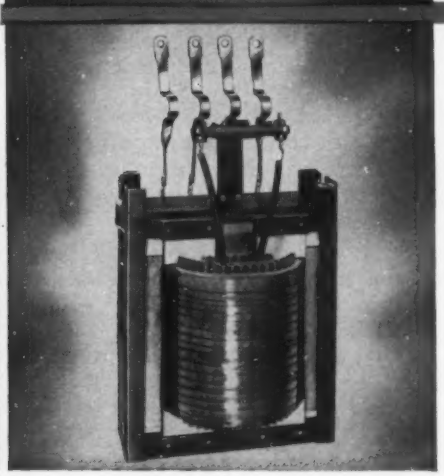


## 4 High Impulse Strength

At the line ends of the high voltage coil, extra insulation is provided between layers of the winding, and cording is placed between adjacent turns. At higher voltage ratings the high voltage winding is sectionalized to reduce the voltage between adjacent ends of succeeding layers. This practice reduces the turn-to-turn and layer-to-layer stresses and, consequently, gives the coil high impulse strength.

## 5 Low Impedance, Improved Voltage Regulation

The low-high-low sequence coil design used in Moloney Distribution Transformers is one of the contributing factors to low impedance. Because of this low impedance, Moloney Distribution Transformers have a lower internal voltage drop under all conditions of load. The result is improved voltage regulation which means customer satisfaction and increased revenue.



## 6 High Efficiency

The efficiency of any transmission and distribution system depends wholly upon its components. The high efficiency of Moloney Distribution Transformers, resulting from low total losses, is one of the reasons why Moloney Transformers, installed in your system, afford . . . "More Power To You."

"How your purchase dollars
return to you
through Westinghouse leadership"

**A. J. Maslin,** *Manager, Substation and Tap Changer Engineering*

# *New Triplex three-phase distribution regulator costs 30% less, uses 26% less pad space, cuts weight 39%*

Now you can enjoy the true economies of a low-cost, three-phase feeder voltage regulator . . . with all the *time-proved capabilities* of the Westinghouse line of distribution regulators. In fact, Westinghouse uses three well-known URF regulators, gang-operated in a single tank to bring you these big savings. The new type SVR-FT regulator is completely automatic and self-contained. Available in 8.6- and 13.2-kv voltage classes.

The savings of standardized design are passed along to you in both initial cost savings and reduced operating costs. Savings of 30% and more. Answering the need for compact units, the SVR-FT requires only 49″ x 87″ of free area for a 500-kva regulator . . . 26% savings in space. This same unit weighs just 10,700 pounds . . . 39% savings in weight.

You also gain all the advantages that have been proved in hundreds of Westinghouse URF installations: continuous monitoring with the CVR inverse time delay relay, direct drive geneva tap changer, and 1¼%-step regulation. Check the picture captions for more details.

Call your Westinghouse sales engineer to learn more about the way your purchase dollars return to you through extra values such as the SVR-FT.

J-70937

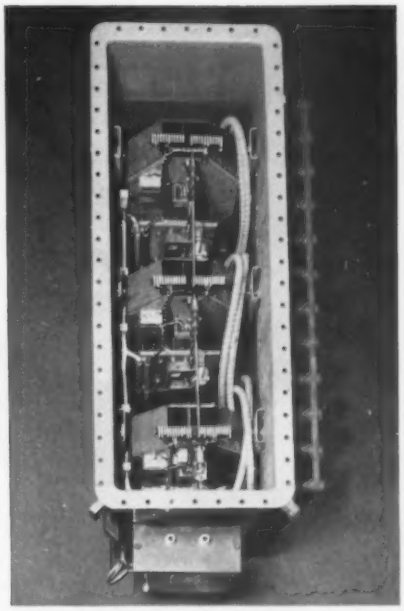
Continuous system voltage monitoring of the CVR relay provides faster correction of abrupt voltage changes . . . holds closer to set balance voltage.

YOU CAN BE SURE...IF IT'S **Westinghouse**

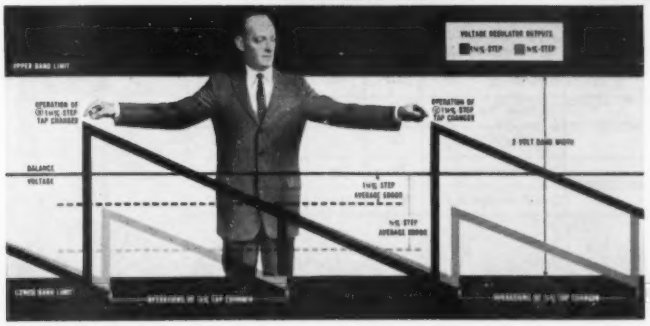
WATCH "WESTINGHOUSE LUCILLE BALL DESI ARNAZ SHOWS" CBS TV ALTERNATE FRIDAYS

Instant-response tap changer corrects voltage 15 times faster. Requires only one second for 1¼% correction after relay operation; full buck to full boost in 13 seconds.

Mr. E. H. Carroll, Westinghouse representative, inspects the installation of this SVR-FT voltage regulator which offers a low-cost approach to three-phase regulation. Operating on the Oklahoma Gas and Electric system, the new regulator is completely self-contained.



Three single-phase units are mechanically interlocked . . . uniform tap positions assured. Units are interchangeable . . . can be removed without disturbing others. Separate tap changer compartments prevent contamination of main tank oil.




Sixteen-step (1¼%) regulation provides narrowest *effective* bandwidth. There are 42% fewer operations than with any other three-phase regulator . . . less wear, longer life.

# THE SANGAMO P-3 GIVES ALL THE BENEFITS OF... THREE STATOR METERING

**WITH THESE PLUS FEATURES:**

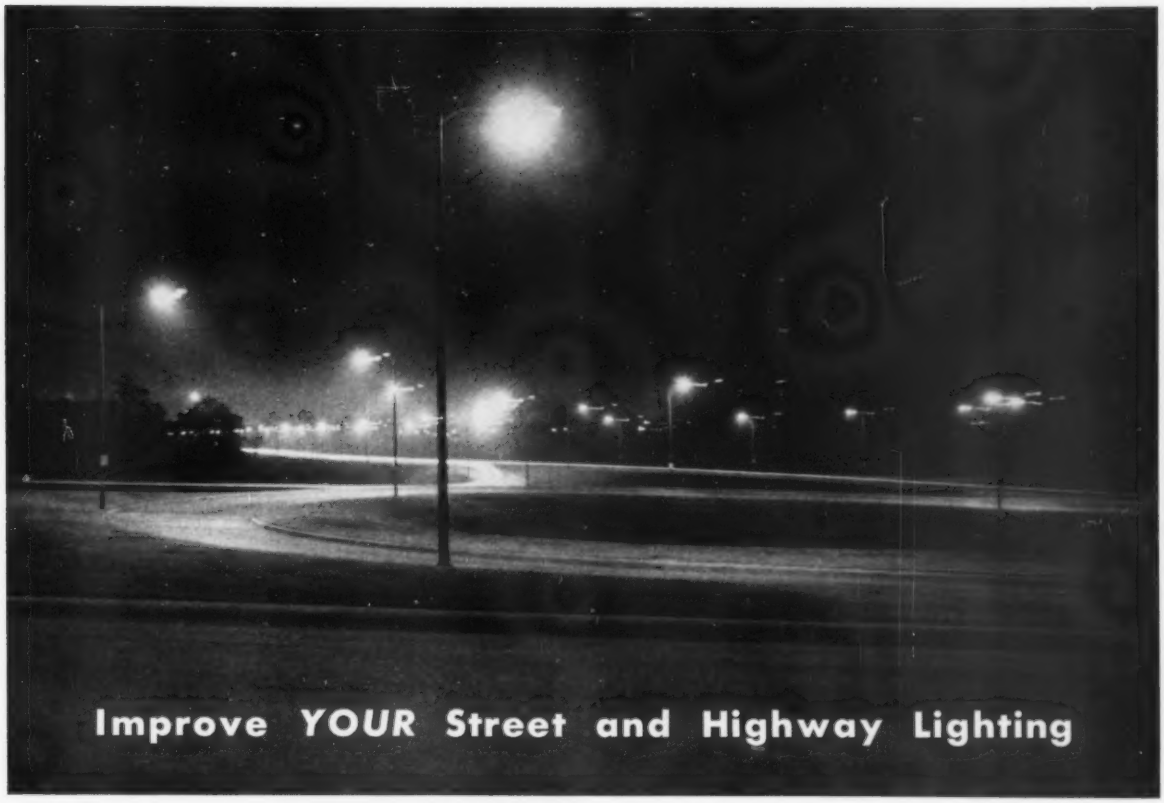
| | | P3 | Other 3-stator meters Type X | Type Y | Type Z |
|---|---|---|---|---|---|
| APPLICATION | Complete Line | Yes | No | No | No |
| | Continuous Capacity (Amps) | 200 | 150 | 175 | 150 |
| | Least Switchboard Space | Yes | No | No | No |
| DESIGN | Number of Disks | 1 | 2 | 2 | 3 |
| | Smallest Size | Yes | No | No | No |
| | Minimum Weight | 9 lbs | 17 lbs | 18 lbs | 12 lbs |
| TESTING | Number of Adjustments | 8 | 10 | 11 | 12 |
| | All Micrometer Adjustments | Yes | No | Yes | No |
| | Easiest to Test | Yes | No | No | No |
| ACCURACY | Disk Speed (Rpm.) | 8⅓ | 30 | 16⅔ | 30 |
| | Lowest Starting Watts | Yes | No | No | No |
| MAINTENANCE | Sectionalized Construction | Yes | No | No | No |
| | Cover Replacement Cost | $2.56 | $3.71 | $10.25 | $7.05 |

Sangamo has developed this three-stator polyphase meter to meet the measurement problems created by today's large loads.

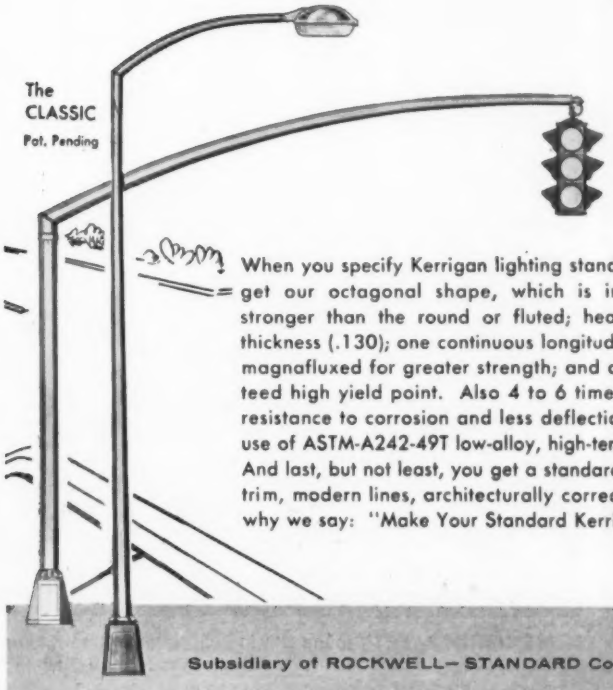
The P3 is the smallest, lightest three-stator meter made . . . the only one with single disk, round cover, modern design. It is a slow speed meter. And, it is the only three-stator meter with full 200 ampere capacity. Fill your three-stator metering requirements with Sangamo's complete line of P3 Meters (Class 10, 100, and 200 in socket and bottom-connected construction).

**SANGAMO ELECTRIC COMPANY**
**SPRINGFIELD, ILLINOIS**

JM60-2




## MAKE YOUR *STANDARD* KERRIGAN




When you specify Kerrigan lighting standards you get our octagonal shape, which is inherently stronger than the round or fluted; heavier wall thickness (.130); one continuous longitudinal weld magnafluxed for greater strength; and a guaranteed high yield point. Also 4 to 6 times greater resistance to corrosion and less deflection by our use of ASTM-A242-49T low-alloy, high-tensile steel. And last, but not least, you get a standard that has trim, modern lines, architecturally correct. That's why we say: "Make Your Standard Kerrigan!"

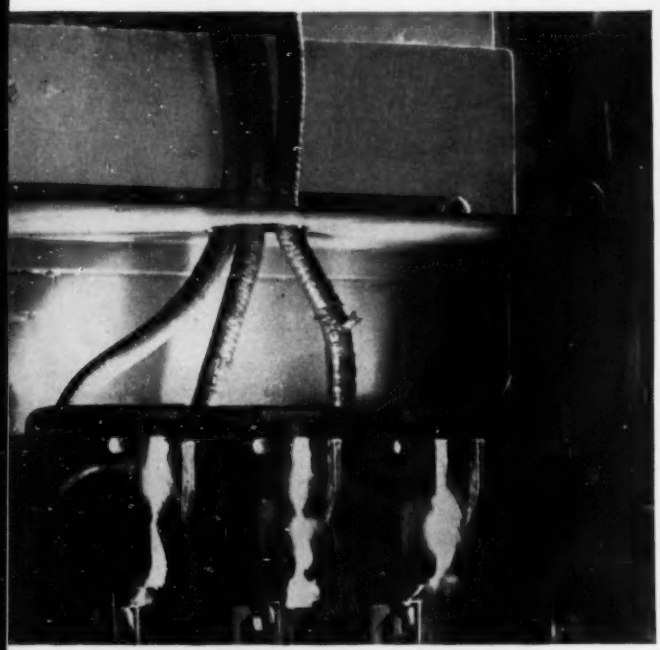
*Our new 70-page catalog has the engineering facts on both steel and aluminum standards! Won't you write for your FREE copy now? Address: Dep't. ES-4.*

KERRIGAN
IRON WORKS COMPANY
Nashville, Tennessee

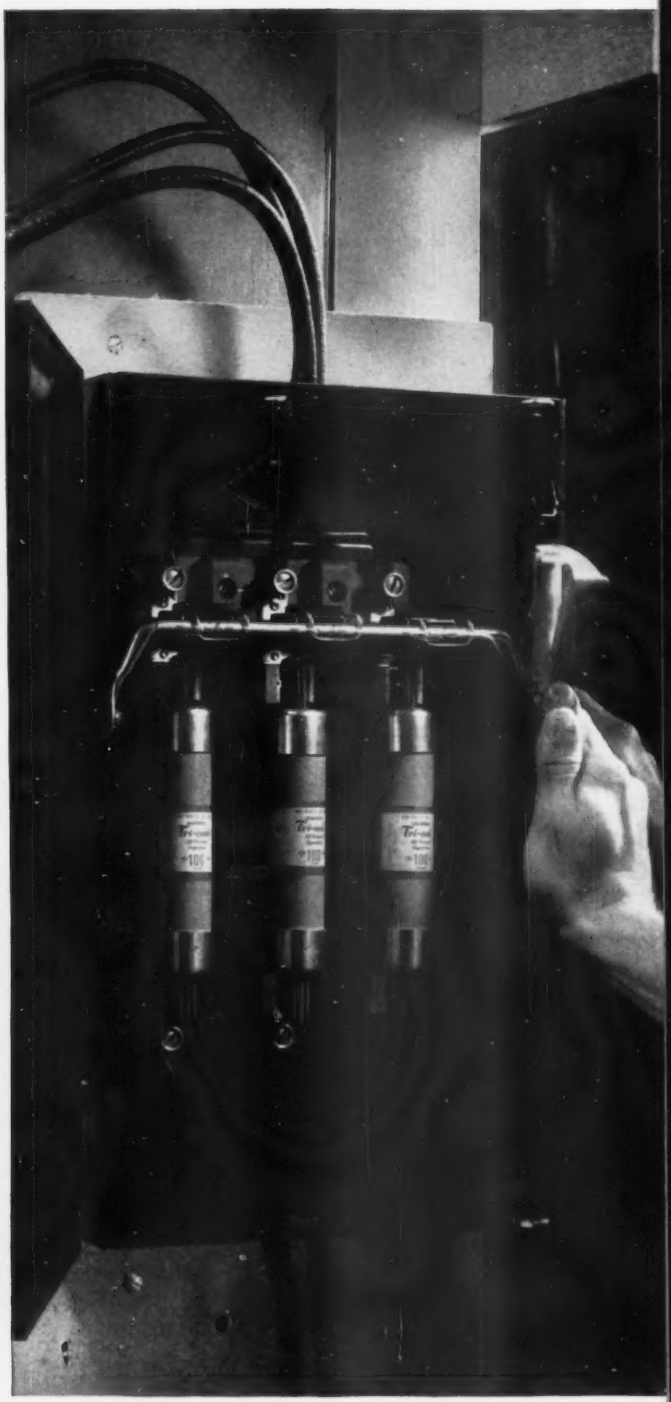
Subsidiary of ROCKWELL—STANDARD Corporation

# FOR SAFETY'S SAKE:

**1. RUINOUS ARC** in open knifeblade switch. At moment of "break" a flash explosion occurs. Blades pit, burn, deteriorate. Danger of fire is ever-present in open blade switches.



**2. SUBDUED ARC** in modified knifeblade switch. Closures or "quenchers" retard arcing slightly, but since blades must ultimately be pulled clear of closures the hazards still exist.



**3. MAXIMUM SAFETY** found only in BullDog Vacu-Break* Safety Switches. Arcing is confined inside compact Vacu-Break chambers. Arcs are snuffed out before they can cause any serious damage.

*Unretouched photographs of the arc in 100-amp 600-volt switches operating under 90-amp 440-volt load with 40% to 50% power factor. All pictures taken at exact instant of "break."*

# HERE'S THE REAL STORY ON SAFETY IN SAFETY SWITCHES

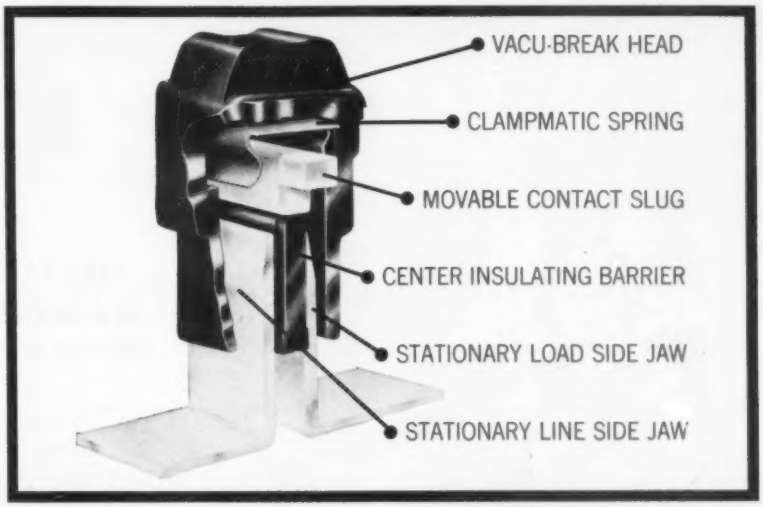
There's a big difference in safety switches—a difference between maximum safety and half-way safety . . . low maintenance and excessive maintenance. These differences are quickly apparent when you compare BullDog Vacu-Break® Safety Switches with the other main type —the open knifeblade switch.

**BULLDOG** discarded the knifeblade design twenty years ago when they engineered the Vacu-Break. It is based on the engineering principle that an arc is the least destructive or dangerous if confined in an arc chamber which limits the oxygen supply . . . actually starves the arc before it can build up. "Explosions" are non-existent . . . the need for maintenance of contact points is virtually eliminated. Today, only BullDog has the Vacu-Break or anything like it. And it is available at no extra cost on both the Master and Junior and Raintight lines.

**OPERATION** of the Vacu-Break is simple, sure and safe. A sturdy rod attached to the operating handle is clamped directly to the Vacu-Break heads. When the handle is pushed "Off," this rod literally yanks the heads away from the stationary contacts. *Double "break" action is quick, foolproof.* Unlike knifeblade types, you need not depend on tricky spring and trigger mechanisms. You don't have to open the switch cover and check to see that contact has been broken!

**100,000 AMP TEST.** BullDog Vacu-Break Safety Switches, when used with current-limiting type Amp-Traps**, will withstand the most severe fault currents. In recent tests standard BullDog switches with Amp-Traps have been subjected to a 100,000 amp short circuit current. *The switches were undamaged!*

**THE CLAMPMATIC* ASSEMBLY** (see the illustration below) is another safety feature of BullDog Vacu-Break Safety Switches. It gives bolt-tight contact in the "On" position, helps accelerate "break" when the switch is pushed "Off." You provide real value, too. Vacu-Break Safety Switches cost no more. Compare!




Close-up of Vacu-Break head shows movable contact slug inside the compact, oxygen-limiting chamber. Clampmatic assembly assures bolt-tight contact, speeds "break." This combination guarantees positive, safe operation, long switch life.

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Michigan. In Canada: 80 Clayson Rd., Toronto, Ont. Export Division: 13 East 40th St., New York 16, N. Y.

* *Vacu-Break and Clampmatic are registered trademarks of the I-T-E Circuit Breaker Company.*

** *Amp-Trap is a registered trademark of the Chase-Shawmut Company.*

*Consult the following Southern representatives:*

**Wilson Electrical Equipment Co.**
3210 Garrow St., P.O. Box 1725
Houston, Texas

**Wilson Electrical Equipment Co.**
101 E. Maple Street
San Antonio, Texas

**Standard Electric Mfg. Company**
2401 Federal St., P.O. Box 1138
Dallas 1, Texas

**Walker Electrical Co., Inc.**
125 Bennett St., N.W., P.O. Box 2308, Station D
Atlanta, Georgia

**FOR SAFETY'S SAKE—BUY VACU-BREAK**

**BULLDOG ELECTRIC PRODUCTS DIVISION**
**I-T-E CIRCUIT BREAKER COMPANY**

# WIN A HAWAIIAN HOLIDAY

in the **HOTPOINT**
**MEDALLION HOME PROGRAM**

MEDALLION HOME ® LIVE BETTER ELECTRICALLY

A fun-filled trip to America's Paradise in the Pacific awaits power supplier representatives in the Hotpoint Medallion Home Program. This dynamic advertising and merchandising program is power-packed to help you turn more builders into Medallion Home builders.

Hotpoint backs up this tremendous load-building program with the quality appliances the public prefers plus . . . . 1960's greatest boost to all-electric living . . .

## NEW
## HOTPOINT ELECTRIC BASEBOARD HEATING
### WITH CALROD® HEATING UNITS

Hotpoint offers the load-building benefits of electric heating – clean, safe, comfortable, convenient, economical – plus the proven performance of famous Calrod heating units. Call your Hotpoint distributor today for complete details on new Electric Baseboard Heating, the Hotpoint Medallion Home Program, and your Hawaiian Holiday.

# Hotpoint

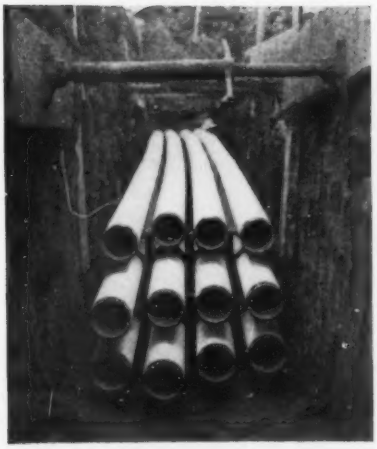
*A Division of General Electric Company, Chicago 44, Illinois*

ELECTRIC RANGES • REFRIGERATORS • AUTOMATIC WASHERS • CLOTHES DRYERS • CUSTOMLINE® • DISHWASHERS
DISPOSALLS® • WATER HEATERS • FOOD FREEZERS • AIR CONDITIONERS • ELECTRIC BASEBOARD HEATING

*Get peak cable protection* ***at lowest dollar cost***

Transite Ducts can be laid directly in trench without concrete envelope. Or if ductbank is to be concrete enclosed—thinner walled Transite Duct may be used. In all other respects both heavy-wall and thin-wall Transite Ducts are identical.

# Transite Ducts save on the job and after!



### No other duct material gives you so many installation and in-service economies

In every way, Transite® Ducts are the most efficient electrical ducts you can install. And—when assembled with J-M's Plastic Coupling—their cost is remarkably low!

One reason for this economy is in installation. Strong, lightweight, long—Transite lengths are easy to handle and install . . . Your men set the ducts in place easily, join them tightly in seconds. Transite's smooth bore is free of burrs and obstructions. Thus, long cable pulls are easily accomplished with no damage to cable sheathing.

You see another reason for Transite's economy in performance. Once in service, Transite's unusually high rate of heat dissipation means cables run cooler, last longer. Transite also confines arc damage . . . cannot burn, smoke or fume. It won't generate explosive or toxic gases. If arcing does occur, Transite Ducts won't sag or adhere to cable.

Let us send the Transite Duct brochure EL-29A. Write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

**JOHNS-MANVILLE** JM PRODUCTS

# Recent development in structures

## Transmission tower design follows European practice

◆ A MAJOR REDUCTION in the over-all cost of high voltage transmission lines is on the horizon, according to officials of Aluminum Limited.

Four years of design study followed by more than a year of intensive development and test work have led to the design of the Alcan Guyed Tower—a versatile aluminum tower made up of components which can be erected in either of two arrangements to suit conditions of terrain and right-of-way.

Development and testing of the new tower was carried out by transmission line engineers and structural designers of the Aluminum Company of Canada, Ltd., principal subsidiary of Aluminium Limited.

Particularly suited for single circuit lines, the tower promises major savings in initial cost, transportation, footing installation and erection. To demonstrate the economies possible, a preassembled 345 kilovolt tower measuring 96 feet to its crossarm, was raised into position using a regular pole line truck and rigging in a little less than seven minutes.

A 96-foot-high 345 kv transmission tower contains about 2,700 pounds of aluminum, varying of course with line loadings, and compares to a weight of about 7,500 pounds if designed in steel and about 15,000 pounds if designed as a conventional steel rigid tower.

Guyed towers of various shapes have been used in Europe for more than thirty years. Early studies by Alcan engineers in 1956, when planning the 345 kv transmission lines for a new hydroelectric power station at Chute-des-Passes, Quebec, clearly showed that the advantages of guyed towers applied to North America.

Advantages of aluminum in a structure of this kind were established as well as the scheme of interchangeable tower components permitting either a "V" or parallel arrangement of legs.

The first Alcan Guyed Tower was erected in the "V" arrangement and after successful conclusion of full scale load tests installation of four line towers followed quickly. Two of these were located on rock and two in a swamp to give the widest range of experience under actual operating conditions.

At the same time, tests on guy anchors in swamp and loose sand were being carried out as well as full scale tests on tower masts. Some of these masts, consisting of tower legs over 100 feet long and weighing less than 9 pounds per foot, were successfully tested to loads of more than 80,000 pounds.

All components of the structures with the exception of nuts, bolts, guy wires and anchorages are of structural aluminum. The plates are made of an Alcan alloy known as 65S-T6 (AA6061-T6 in the United States) and the extruded shapes of a new Aluminium Limited alloy, Alcan B51S (AA-6351 in the U. S.). Standard angle sections are used for minor bracing members but specially designed bulb angles are used for the legs and a lipped channel for the lower chords of the crossarm.

Savings in initial cost and in transporting the much lower ton-

**Example of aluminum guyed tower for 345 kv transmission line. The height to cross arm is 96 feet. Base details are shown at right.**

# for transmission and substations

nage are only a portion of the economies offered by the Alcan Guyed Tower principle.

Other factors are:

Much lighter erection equipment is needed in the field. Depending on the height required, six to ten leg sections, each about 20 feet long, are required for each tower. These and major crossarm components are readily handled by the workmen without need of auxiliary equipment.

The Alcan Guyed Tower needs four or five footings depending on whether the parallel or "V" leg arrangement is used. The number of excavations is not as important however, as the fact that the guy footings or anchorages are much less difficult and less expensive to make as they do not have to be set with the precision required for each of the four footings of a rigid tower. The rougher and more difficult the terrain, the bigger the savings with the Alcan Guyed Tower. *(Con't on page 131)*

## Pole withstands hurricane forces

◆ AN ALRECTIC lattice pole, 85 feet long and two feet square, demonstrated ability to withstand hurricane forces during recent simulated tests before forty utility and consulting engineers. Static loads simulated wind loading up to a maximum of 140 miles per hour, which is 12 per cent greater than NEMA standards. Four severe windloading tests illustrated the high strength of the lattice pole while supporting three 1.28-inch diameter ACSR conductors and a ⅜-inch high strength static wire. These tests simulated winds of 80, 110, 125, and 140 miles per hour.

The pole, designed for Louisiana Power and Light Co., is intended for use on a 69-kv transmission line through congested residential and business areas. Average span will be 600 feet. Fabricated and tested by Handley-Brown Co., Jackson, Mich., the pole will be distributed by Line Material Industries, Milwaukee. It is made of aluminum extrusions supplied by the metal division of Olin Mathieson Chemical Corp.

**This 85-foot aluminum pole designed for Louisiana Power and Light Company will provide support for 69 kv lines in congested areas.**

The lattice pole, complete with three seven-foot crossarms, weighs 1400 pounds, approximately 20 per cent the weight of an equivalent steel pole. In attempting to reduce the weight of the pole, Handley-Brown engineers specially designed extrusion shapes for the main structural members instead of merely substituting aluminum for steel in conventional tower construction. Although the lattice pole does not taper dimensionally from bottom to top, the weight and strength is strategically distributed by using three

sizes of chord angles with stiffener plates welded inside the chords.

To conform to Louisiana Power and Light Company specifications, the pole is welded throughout its entire length, including all chord angle splices and lacing; the slippage that often accompanies bolted construction in conventional towers is eliminated. The only field bolting required during erection of the one-piece Alrectic lattice pole is to connect the crossarms to the pole and the pole to the concrete foundation. However, according to Harold E. Handley, president of Handley-Brown, the Alrectic lattice pole can be field assembled by bolting together truss sections of various lengths. He indicated the pole may have many other industrial applications.

Engineering tests were conducted by bolting the tower horizontally to a support at one end. Weights totaling 6345 pounds were suspended from the crossarms and from other points along the lattice pole's length to represent wind loads on pole and conductors. Simultaneously, horizontal loads totaling 5385 pounds were applied through dynamometers to repre the dead weight of the structure and four conductors.

Under loads equivalent to wind of 140 miles per hour, the pole deflected 84 inches from the horizontal without failure of a single member or weldment, and then it returned virtually to horizontal when the loads were removed.

Features offered by the aluminum Alrectic pole are high strength, light weight, elimination of corrosion, reduced maintenance, high scrap value, and safety to utility personnel and the general public.

### Special weld construction

Handley-Brown Company developed the successful Alrectic system of welding aluminum substation construction widely used by electrical utilities and distributed by Line Material Industries. The new lattice pole, developed along the basic Alrectic principle, uses aluminum alloy 6061-T6. The Alrectic system employs a specially designed extrusion shape for the chord angles. The edges of the chord angles are enlarged with a bulb that has four purposes:

(1) It strengthens the edge where failure usually begins in standard shapes of both aluminum and steel.

(2) It provides room on the chord angle edge for a longitudinal groove into which the lacings are welded. This expedites the positioning of the lacing during the welding process utilizing a large moving fixture.

(3) The groove or track in the bulb permits an exceptionally strong weld, essentially a combination of butt-weld and lap-weld, since the welding material flows down the end and up the side of the lacing. This also eliminates the need of welding from inside the truss.

(4) And most important, the bulb in this application acts to carry off the heat of the welding before it can affect the weld area, reducing the heat effect to a minimum and leaving the area of the weld as strong as the rest of the structure.

# Economies achieved in river crossing towers

◆ BY PLACING suspension towers for a new 230 kv transmission line crossing the Mississippi on the river side of the levees, engineers have been able to achieve material cost savings through a reduction in the height of the towers and the length of the span.

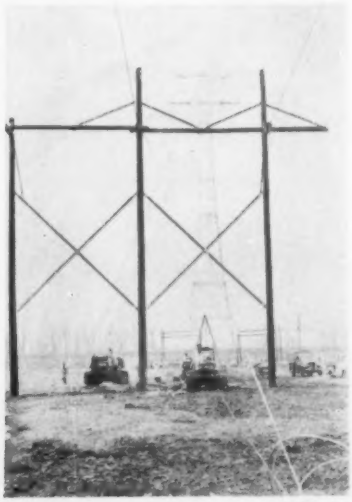
This engineering design feature was incorporated in the new double circuit transmission line recently placed in service by Gulf States Utilities Company over the Mississippi, near Baton Rouge, La.

The unusual arrangement in the placing of the towers was chosen by N. C. Spencer, superintendent of Electrical and Civil Engineering, and associates of Gulf States Utilities of Beaumont, Texas. Stone & Webster Engineering Corporation designed and supervised construction of the transmission line crossing.

### Tower height reduced

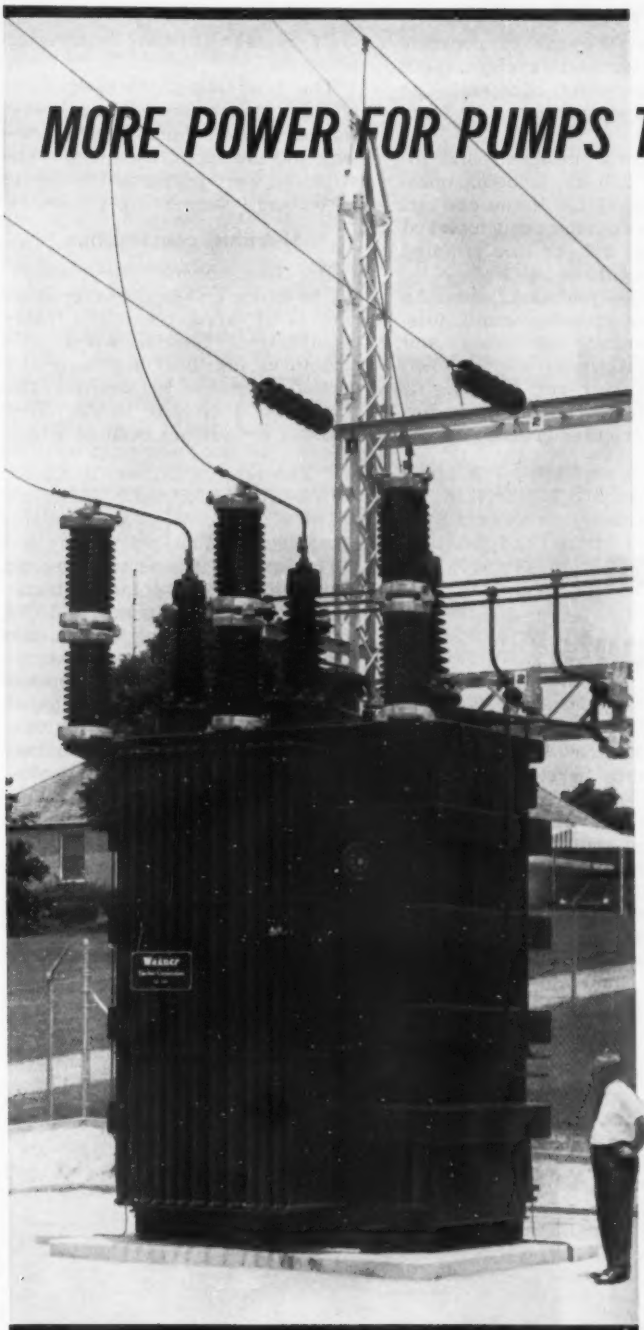
The crossing is located at a point where the river channel is in the center of the river bed. At this point, there has been no bank erosion in the last 50 years, leading engineers to believe that there will not be any erosion in the future. However, the foundations

**View across Mississippi showing west tower on river side of levee which permitted shorter span and reduced tower height.**



**Transmission line at each end of the river crossing is of wood pole "H" frame construction. One conductor is being pulled across.**

# MORE POWER FOR PUMPS THAT PUSH PETROLEUM



**THIS WAGNER TRANSFORMER**

***POWERS-UP***

**PLANTATION PIPELINE**

The Plantation Pipeline Company pumping station at Neese, Georgia, is part of an underground transportation system that pushes high quantities of petroleum products to their market.

The Neese operation was originally served with power from a 44 kv system substation. However, the size of the pumping load—which includes some 1800 hp motors—became too great for the substation to handle adequately.

To better serve the load, Georgia Power Company recently installed a 110 kv line and built a new substation. Wagner Electric Corporation furnished the transformer rated at 7500 Kva for this purpose. Today, Plantation Pipeline pumps with full power.

Now, what about your power needs? If they present a critical (or even a potential problem), call your nearby Wagner Sales Engineer. He'll help you plan your power program . . . suggest Wagner transformers that will meet your needs for years to come. There are Wagner branches in 32 principal cities.

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were so designed that their stability would not be impared by flood conditions or ordinary erosion of the bank.

Placing the towers on the river side of the levees with high concrete foundations, on piles, extending above high water level permitted a span of 3,930 feet between towers. This compares with a span of more than 5,100 feet which would have been required if the towers had been located on the land side of the levees.

Required tower height was reduced from a figure of more than 650 feet to the 421 foot height as installed, thus resulting in the cost saving.

Another feature of this crossing project was the use of concrete anchors at ground level in place of anchor towers at each end. The anchor sites are protected by fencing.

The crossing, designed and insulated for 230 kv, is being operated initially at 138 kv on one circuit with the other circuit reserved for a second 138 kv line crossing in the near future.

Long range planning, selecting of the river crossing conductors, detail planning, surveying and securing of rights of way on each side of the river and securing of approval of various public bodies involved for the crossing were facets of the job performed by Gulf States Utilities engineering personnel.

The designing of the towers and anchor foundations, the preparation of specifications for the crossing and the supervision of its construction were performed by Stone & Webster engineering personnel.

### H-frame construction

The transmission line connecting to either end of the river crossing is of wood pole "H" frame construction. Special wood pole structures are provided near the ground anchors to connect the transmission circuits to the river crossing conductors each of which

# Prefabricated substation put up in only 48 minutes

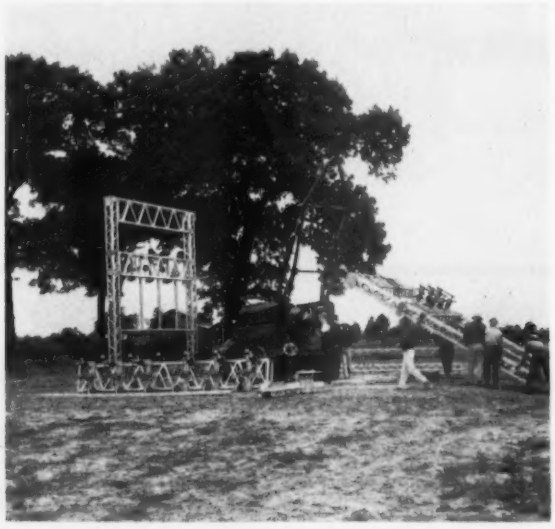
◆ GUESTS at the erection of one of the first Alrectic substations in Americus, Georgia, were amazed recently: first, when a line crew using an "A" frame on a line truck took just 48 minutes to erect a 15′ by 23′ by 19′ all aluminum switching station; and secondly, when the station was energized just 18 working hours after the material arrived at the job site. This line crew had no previous experience in erecting metal structures.

Less than one third the weight of galvanized steel (2,100 vs 7,400 pounds), the prefabricated trusses and structural parts were handled easily by crew and line truck. The substation was designed by Line Material Industries and fabricated by Handley-Brown Co., Jackson, Mich.

The station utilized the Alrectic design of standard columns, trusses, and beams. Designed for 1,000 pounds per conductor tension, the structure provides for one incoming line and three distribution feeder circuits at rated voltage of 7.2/12.47 kv wye. The station features a regulated bus and tandem fuse-switch arrangement that provides continuity of service and feeder protection when reclosers are bypassed for maintenance.

Reducing or eliminating the maintenance of the substation structure by the use of aluminum will improve system efficiency and the safety program as well as customer service.

**10:15 a.m.—Columns and trusses assembled on the ground ready to be lifted into position.**



**10:25 a.m.—One section up and raising second column and truss assembly into position.**

is dead ended with a triple string of 25,000 lb insulators underneath the wood pole structures. A steel cable from the triple string of insulators is continued to the ground level anchor, which consists of two piles with a concrete cap.

Conductors are supported by double strings of 25,000 lb insulators at the suspension towers, but are dead ended at the bottom of the insulator strings rather than being carried through in suspension clamps. It is believed that this arrangement will materially reduce the possibility of fatigue troubles with the conductor. Stockbridge dampers are used on both conductor and static wire. Compression type dead end fittings for the 3,930 foot river spans of the conductor were attached to calculated lengths in the conductor manufacturer's factory. Turnbuckles were provided in all spans for making final sag adjustments.

A flashing beacon at the top of each tower and obstruction lights at the one-third points of the towers are installed for aircraft warning.

A summary of the design features of the river crossing follows:

**Conductors:** Number - Six; Size - 807,000 cm, 46/61 strand ACSR - aluminized core; Weight per Foot - 1.892 lb; Diameter - 1.28″; Ultimate Strength - 72,400 lb; Final Unloaded 60 F Tension - 17,800 lb; Tension - NESC light loading - 20,560 lb; Tension with 25 lb per sq ft Wind - 60 F - 28,520 lb;

**Static Wires:** Number - Two; Size - 7 strand aluminized steel; Weight per Foot - .346 lb; Diameter - .4086″; Ultimate Strength - 17,400 lb; Final unloaded 60 F Tension - 3,500 lb; Tension - NESC light loading - 4,960 lb; Tension with 25 lb per sq ft Wind - 60 F - 7,830 lb;

**Insulators:** Suspension Towers - 2 strings of 20-5 3/4″ by 10″ 25,000 lb insulators per conductor; Anchor Dead Ends - 3 strings of 18 - 5 3/4″ by 10″ 25,000 lb insulators per conductor.

# Reduced regulator bandwidths proved beneficial by computer

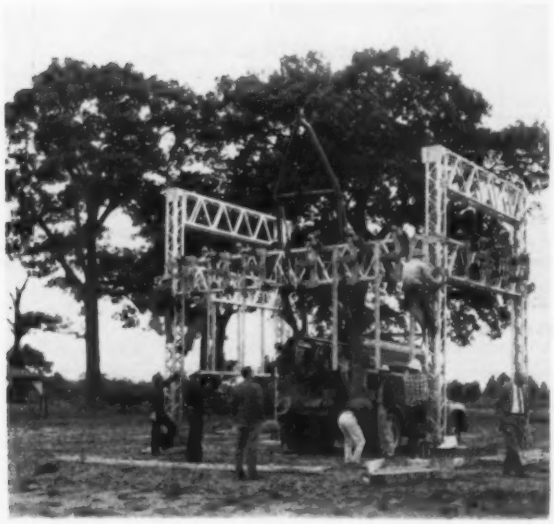
◆ RECENT COMPUTER studies made by the General Electric Company have proved that reduced voltage regulator bandwidths increase system earnings of electric utilities.

According to E. E. Wejman, product planner for the company's Voltage Regulator Product Section, at Pittsfield, Mass., the new studies demonstrate that now bandwidths as narrow as plus or minus ¾ volts are considered practical from any standpoint—including that of equipment life.

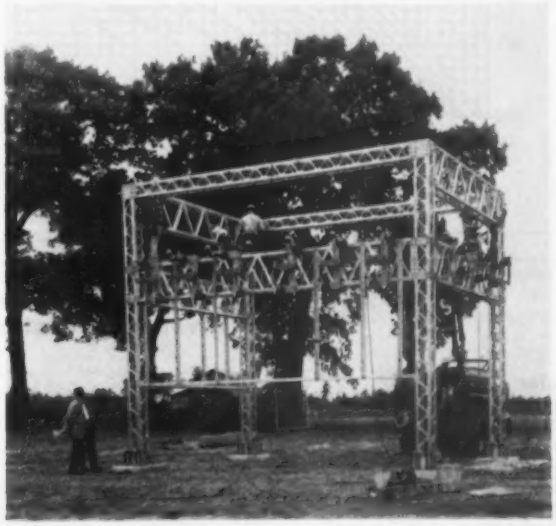
Although electric utilities have always recognized the desirability of a narrow bandwidth for step-type voltage regulators, in some cases it was previously felt that the increased number of regulator operations resulting from a narrower bandwidth would mean vastly increased maintenance costs and shortened equipment life. Wejman stressed, however, that by analyzing actual (as opposed to theoretical) data, G.E. has demonstrated that this has not been the case.

As a typical example, Wejman cited the case of an ML32 regulator with a nominal contact life rating of 1,000,000 operations. Over a 20 year period this regulator can perform 50,000 operations per year without the necessity of replacing switch contacts. At present, many utilities have regulators such as these set with a 3 to 3½ volt bandwidth to restrict regulator operations to 15,000 to 20,000 per year, far short of the equipment's design

*(Continued on page 132)*



**10:37 a.m.—A-frame is being used to hoist truss into place with bypass equipment premounted.**



**11:03 a.m.—Last horizontal truss has been put in place and final check is being made of all bolts.**

# Conductor heat dissipation - 2

By Fred C. DeWeese

Consulting Engineer
Raleigh, N. C.

◆ THE FIRST ARTICLE in this series discussed in a general way the dissipation of heat from electrical conductors by convection and radiation. This second article presents tabular data on the physical and other properties of copper wire for use in calculating heat losses and current carrying capacity and gives the formulas for calculating heat dissipation from electrical conductors.

The example which follows will demonstrate the use of these formulas and data.

**Example 1:** With a 4/0 copper cable having a temperature rise of 45° C above still air of 25° C, it is required to find heat dissipation by free conduction ($w_c$) and heat dissipation by radiation ($w_r$), both in watts per square inch.

Heat dissipation by free conduction, in watts per square inch,

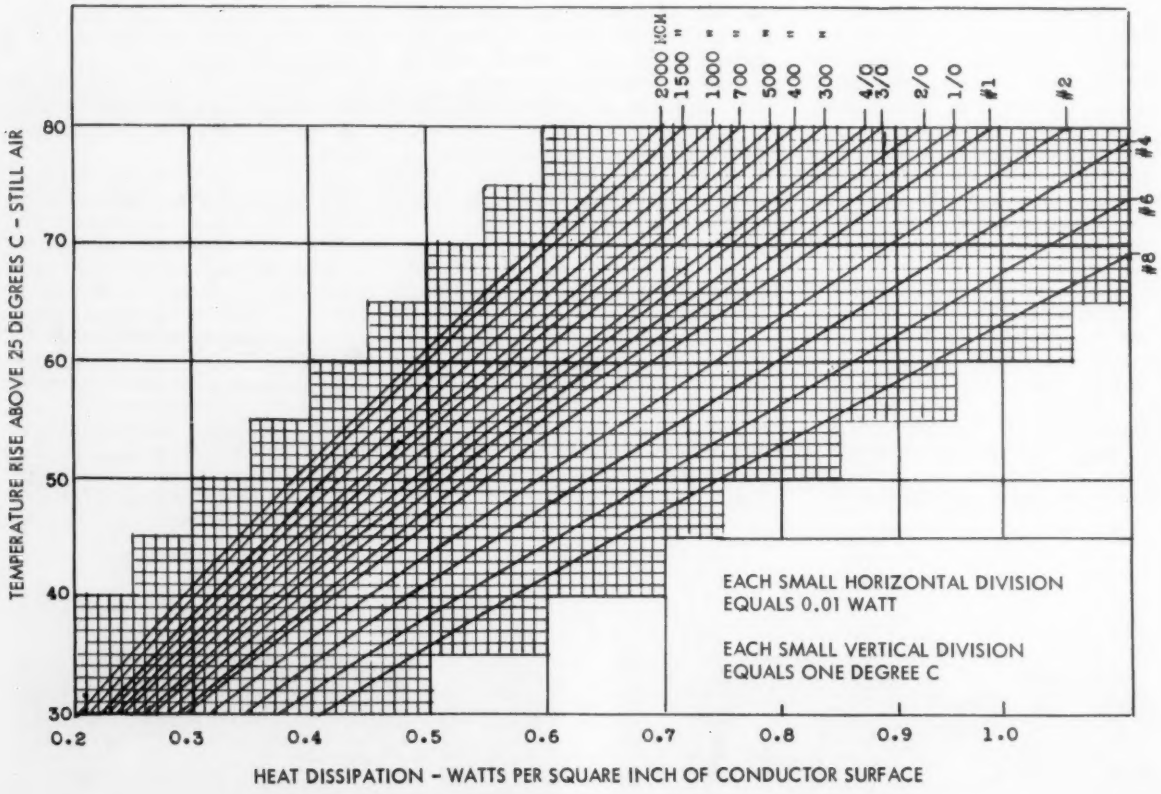



**Fig. 2 - Heat loss curves for copper conductors in still air.**

## Table 1 - Values for use in Equations (1) and (2) for a given temperature rise above 25° still air

| Line | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | $\Delta_t$ temp. rise | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 2 | t°C total temp. | 45 | 50 | 55 | 60 | 65 | 70 | 75 |
| 3 | T°C absolute temp. | 318 | 323 | 328 | 333 | 338 | 343 | 348 |
| 4 | $T_o$°C absolute temp. | 298 | 298 | 298 | 298 | 298 | 298 | 298 |
| 5 | $T_a = (T + T_o)/2$ | 308 | 310.5 | 313 | 315.5 | 318 | 320.5 | 323 |
| 6 | numerator of (1) | 0.02633 | 0.03311 | 0.03998 | 0.04692 | 0.05394 | 0.06104 | 0.06823 |
| 7 | $0.0031 \times T_a^{.947}$ | 0.70472 | 0.71015 | 0.71554 | 0.72097 | 0.72639 | 0.73179 | 0.73718 |
| 8 | $\Delta_t^{.27}$ | 2.2453 | 2.3847 | 2.5051 | 2.6116 | 2.7074 | 2.7949 | 2.8756 |
| 9 | $w_r$ watts/sq.in. | 0.04306 | 0.05518 | 0.06786 | 0.08114 | 0.09505 | 0.10957 | 0.12475 |

## Table 2 - Physical and other properties for use in calculating heat loss and current carrying capacities of copper wire and cable

| AWG | C.M. | Wires | "d" dia. in. | $(d)^{.81}$ 2.302585 x d | | "S" sq. in. | "A" Area per inch/sq. in. | "A" Area per ft./sq. in. | "A" Area per mile/sq. in. |
|---|---|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| 8 | 16,510 | 1 | 0.12849 | 0.18975 | 0.29586 | 0.01297 | 0.40366 | 4.8440 | 25,576 |
| 7 | 20,816 | 1 | .14428 | .20843 | .33221 | .01635 | .45327 | 5.4392 | 28,719 |
| 6 | 26,251 | 1 | .16202 | .22896 | .37307 | .02062 | .50900 | 6.1081 | 32,250 |
| 5 | 33,102 | 1 | .18194 | .25150 | .41893 | .02600 | .57158 | 6.8590 | 36,215 |
| 4 | 41,742 | 1 | .20431 | .27627 | .47044 | .03278 | .64186 | 7.7022 | 40,668 |
| 3 | 52,634 | 1 | 0.22942 | 0.30347 | 0.52826 | 0.04134 | 0.72074 | 8.6490 | 45,666 |
| 2 | 66,373 | 1 | .25763 | .33336 | .59322 | .05213 | .80937 | 9.7124 | 51,282 |
| 1 | 83,694 | 7 | .32803 | .40528 | .75533 | .06573 | 1.03054 | 12.3666 | 65,296 |
| 1/0 | 105,538 | 7 | .36836 | .44535 | .84819 | .09289 | 1.15724 | 13.8870 | 73,323 |
| 2/0 | 133,079 | 7 | .41365 | .48918 | .95245 | .10452 | 1.29952 | 15.5940 | 82,337 |
| 3/0 | 167,805 | 7 | 0.46449 | 0.53734 | 1.06952 | 0.13179 | 1.45924 | 17.5105 | 92,457 |
| 4/0 | 211,600 | 7 | .52159 | .59036 | 1.20101 | .16619 | 1.63862 | 19.6635 | 103,823 |
| | 250,000 | 19 | .57354 | .63740 | 1.32062 | .19635 | 1.80183 | 21.6219 | 114,163 |
| | 300,000 | 19 | .62828 | .68628 | 1.44667 | .23562 | 1.97380 | 23.6856 | 125,060 |
| | 350,000 | 19 | .67862 | .73048 | 1.56258 | .27489 | 2.13195 | 25.5834 | 135,080 |
| | 400,000 | 19 | 0.72548 | 0.77154 | 1.67047 | 0.31416 | 2.27916 | 27.3496 | 144,406 |
| | 450,000 | 19 | .76948 | .81109 | 1.77180 | .35343 | 2.41739 | 29.0089 | 153,166 |
| | 500,000 | 37 | .81373 | .84623 | 1.87369 | .39270 | 2.55641 | 30.6770 | 161,975 |
| | 550,000 | 61 | .85459 | .88016 | 1.96777 | .43197 | 2.68477 | 32.2174 | 170,108 |
| | 600,000 | 61 | .89259 | .91929 | 2.05527 | .47124 | 2.80415 | 33.6499 | 177,672 |
| | 650,000 | 61 | 0.92904 | 0.94192 | 2.13919 | 0.51051 | 2.91867 | 35.0240 | 184,927 |
| | 700,000 | 61 | .96411 | .97083 | 2.21995 | .54978 | 3.02884 | 36.3461 | 191,907 |
| | 750,000 | 61 | .99795 | .99834 | 2.29786 | .58905 | 3.13515 | 37.6218 | 198,643 |
| | 800,000 | 61 | 1.03068 | 1.02470 | 2.37322 | .62832 | 3.23798 | 38.8557 | 205,158 |
| | 850,000 | 61 | 1.06240 | 1.05030 | 2.44627 | .66759 | 3.33763 | 40.0520 | 211,472 |
| | 900,000 | 61 | 1.09320 | 1.0743 | 2.51719 | 0.70686 | 3.43439 | 41.2127 | 217,602 |
| | 950,000 | 61 | 1.12315 | 1.0986 | 2.58615 | .74613 | 3.52848 | 42.3416 | 223,564 |
| | 1,000,000 | 61 | 1.15233 | 1.1217 | 2.65334 | .78540 | 3.62015 | 43.4412 | 229,369 |
| | 1,100,000 | 61 | 1.20940 | 1.1665 | 2.78475 | .86394 | 3.79944 | 45.5933 | 240,732 |
| | 1,200,000 | 61 | 1.26317 | 1.2083 | 2.90856 | .94248 | 3.96837 | 47.6204 | 251,435 |
| | 1,250,000 | 91 | 1.2892 | 1.2285 | 2.9685 | 0.98175 | 4.0502 | 48.6025 | 256,621 |
| | 1,300,000 | 91 | 1.3148 | 1.2481 | 3.0273 | 1.02102 | 4.1304 | 49.5649 | 261,703 |
| | 1,400,000 | 91 | 1.3644 | 1.2862 | 3.1416 | 1.09956 | 4.2863 | 51.4359 | 271,582 |
| | 1,500,000 | 91 | 1.4123 | 1.3226 | 3.2519 | 1.17810 | 4.4368 | 53.2413 | 281,114 |
| | 1,600,000 | 127 | 1.4592 | 1.3581 | 3.3598 | 1.25664 | 4.5841 | 55.0090 | 290,448 |
| | 1,700,000 | 127 | 1.5041 | 1.3919 | 3.4632 | 1.33518 | 4.7251 | 56.7017 | 299,385 |
| | 1,750,000 | 127 | 1.5262 | 1.4084 | 3.5141 | 1.37445 | 4.7945 | 57.5345 | 303,782 |
| | 1,800,000 | 127 | 1.5477 | 1.4244 | 3.5636 | 1.41372 | 4.8622 | 58.3458 | 308,066 |
| | 1,900,000 | 127 | 1.5901 | 1.4560 | 3.6613 | 1.49226 | 4.9954 | 59.9460 | 316,515 |
| | 2,000,000 | 127 | 1.6314 | 1.4865 | 3.7564 | 1.57080 | 5.1252 | 61.5020 | 324,730 |

Diameter of a solid wire = 1.1229322 x diameter next smaller size.
Equals 0.8905257 x diameter next larger size.
The current carrying capacity of a given conductor, at a given tempearture rise, is most simply determined from the area per mile in column (10). However, use can be made of columns (8) and (9).

From column (8) $I = \sqrt{\frac{A \text{ per inch} \times w}{R_{60} \times 1.578 \times 10^{-8}}}$

From (9) $I = \sqrt{\frac{A \text{ per ft} \times w}{R_{60} \times 1.894 \times 10^{-6}}}$

**Notes on Table 1:**
The numerator of (1) = $1.75 \times 10^{-6} \times T_a^{.754}$ x temperature rise $\Delta_t$°

For conductor with normally weathered surface the emissivity constant "e" is given as 0.5, basis for deriving values of $w_r$, line 9. For non-weathered conductor "e" should be taken as 0.3, in which case the table values should be multiplied by 0.6.

| Line (continued) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | $\Delta_t$ temp. rise | 55 | 60 | 65 | 70 | 75 | 80 |
| 2 | t°C total temp. | 80 | 85 | 90 | 95 | 100 | 105 |
| 3 | T°C absolute temp. | 353 | 358 | 363 | 368 | 373 | 378 |
| 4 | $T_o$°C absolute temp. | 298 | 298 | 298 | 298 | 298 | 298 |
| 5 | $T_a = (T + T_o)/2$ | 325 .5 | 328 | 330 .5 | 333 | 335 .5 | 338 |
| 6 | numerator of (1) | 0.07549 | 0.08282 | 0.09024 | 0.09774 | 0.10531 | 0.11296 |
| 7 | $0.0031 \times T_a^{.947}$ | 0.74260 | 0.74800 | 0.75339 | 0.75879 | 0.76418 | 0.76959 |
| 8 | $\Delta_t^{.27}$ | 2.9505 | 3.0207 | 3.0866 | 3.1491 | 3.2082 | 3.2646 |
| 9 | $w_r$ watts/sq.in. | 0.14059 | 0.15714 | 0.17438 | 0.19235 | 0.21107 | 0.23055 |

may be calculated by the following equation:

$$w_c = \frac{0.0000175 \times T_a^{.754} \times \Delta_t}{d \times \log_e \left[ \frac{0.0031 \times T_a^{.947}}{d^{.81} \times \Delta_t^{.27}} + 1 \right]} \quad (1)$$

Heat dissipation by radiation is given by the Stefan-Boltzmann law, from which

$$w_r = 5.31 \times e(T^4 - T_0^4)\, 10^{-9} \text{ watts per sq. ft.}$$
$$= 36.8 \times e\, [(T/1000)^4 - (T_0/1000)^4] \text{ watts per sq. in.} \quad (2)$$

where
$t$ = total temperature
$= 25 + 45 = 70°C.$
$\Delta_t$ = temperature rise degrees C.
$T = 273 + 70 = 343°C$
= absolute temperature of conductor.
$T_0 = 273 + 25 = 298°C$
= absolute temperature of surrounding air.
$T_a = 320.5$ (average of T and $T_0$)
$e$ = the radiation emissivity coefficient, usually taken as 0.5 for copper or aluminum of average weathered surface.

Equation (1) meets the general requirements for calculating heat dissipation by free convection, (still air) since it is applicable for any temperature at any given temperature rise.

Equation (2) is applicable for calculating heat dissipation by radiation, and as previously mentioned, is not affected by the diameter of the conductor.

From a first consideration of Equation (1) it would seem to be rather involved and performing the several mathematical operations quite laborious. This is true were it required to run through the calculations for each given value of temperature rise for each size of wire or cable.

Fortunately, solving this equation for $w_c$ can be made quite simple by first computing and tabulating certain values that are common to any given temperature rise and size of conductor. Such values will be found in Tables 1 and 2. It is necessary to compute the values of $T_a^{.754}$ and $T_a^{.947}$ although it is not essential that they be tabulated.

For the various values of temperature rise, in addition to other pertinent information, Table 1 gives the numerator of Equation (1), $0.0000175 \times T_a^{.754} \times \Delta_t$ on line 6; $0.0031 \times T_a^{.947}$ on line 7; and $\Delta_t^{.27}$ on line 8. Table 2 gives physical properties of copper wire and cable and other information essential to the solution of equation, some of which information is not generally otherwise available.

In calculating heat dissipation by free convection, the values on lines 6, 7 and 8, Table 1, are used in combination with the values in columns (4), (5) and (6), in Table 2. The values in column (10), Table 2, are used when calculating current carrying capacities of conductors under various conditions of temperature. When reference is made to "line number" it refers to Table 1; and when to a "column number" to Table 2.

Refer back to Example 1 and select the proper values from the tables for substitution in Equation (1), all of which are below $\Delta_t$ equals 45 degrees on lines 6, 7 and 8, Table 1, and opposite 4/0 copper in columns (4), (5) and (6), Table 2. Note the ease and simplicity

*(Continued on page 131)*

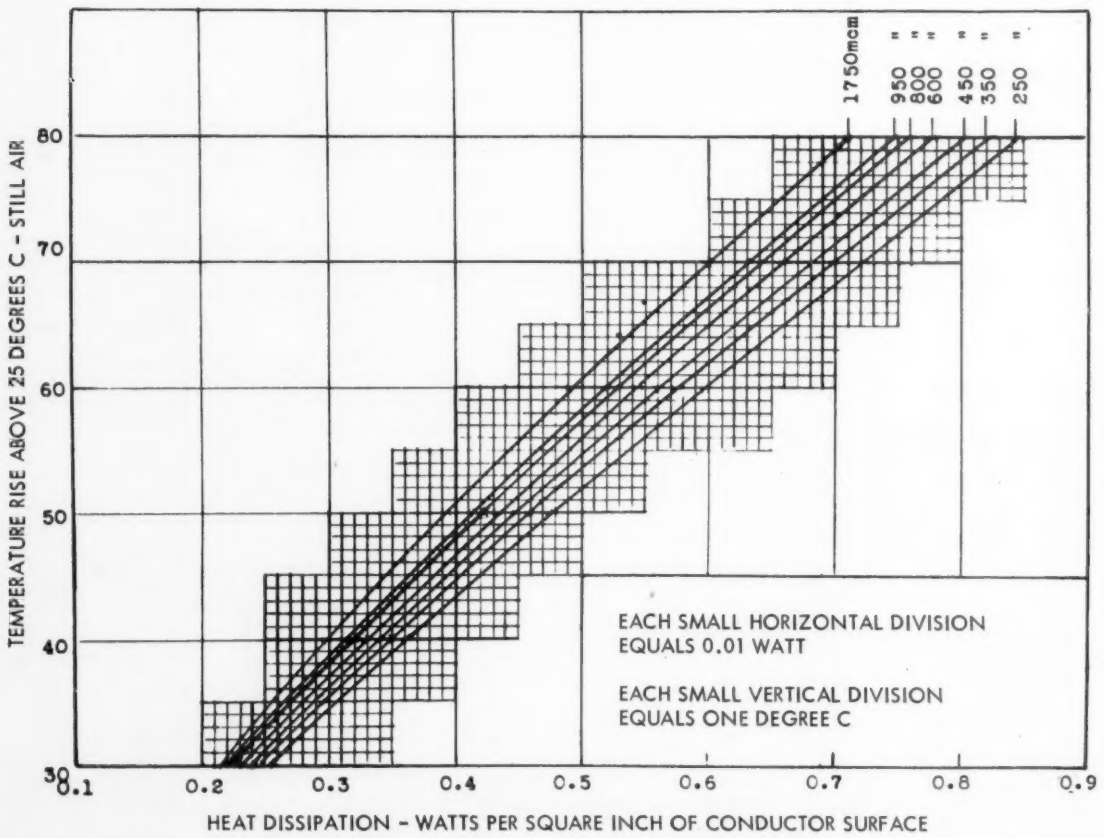



**Fig. 3—More heat loss curves for copper conductors in still air.**

*Here's a low-cost guy*

*you'll never have to replace...*

Copperweld®

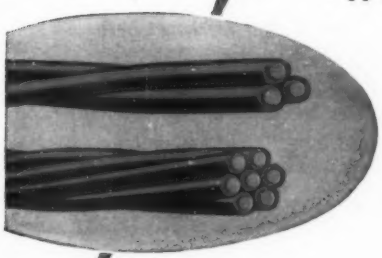
TYPE **M**™ **STRAND**

## ...gives you both strength and permanence

Here's an easy way to eliminate the trouble and expense caused by the failure of rust-weakened guys. Install Copperweld Type M Strand—it's your best buy for all guying purposes.

The rugged strength of Type M Strand is permanent because each wire is protected against corrosion by a thick cladding of pure copper molten-welded to the steel core. The copper cannot crack, flake or peel so there's no danger of corrosion even getting started.

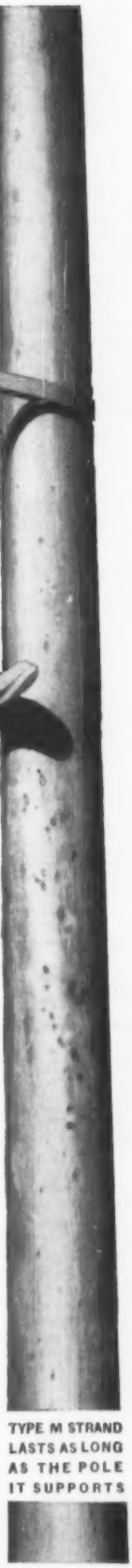
You can count on dependable, maintenance-free support from Type M Guy Strand. Easy to install, it can be dead-ended by any of the conventional methods. Write today for complete engineering data.



COPPERWELD STEEL COMPANY

WIRE AND CABLE DIVISION *Glassport, Pa.*

For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York



TYPE M STRAND LASTS AS LONG AS THE POLE IT SUPPORTS

# Estimating labor unit data for

◆ ADDITIONAL tables are presented this month in the series covering man-hour labor units for outside electrical construction.

These are being published by special permission of Gulf Publishing Co., Houston, Tex., being part of their recently published book, "Estimator's Electrical Man-Hour Manual," by John S. Page and Jim G. Nation.

As explained in the first article which appeared in the March 1960 issue of ELECTRICAL SOUTH, the labor units given in these tables are based on average productivity efficiency. Copies of that first article, explaining the productivity factors and methods of evaluating the data will be sent to new readers upon request (Address request to The Editor, ELECTRICAL SOUTH, 806 Peachtree St., NE, Atlanta. Ga.)

Additional tables of labor units in this series will appear in the June issue of ELECTRICAL SOUTH

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**All data presented in this article copyrighted 1959 by John S. Page and Jim G. Nation.**

## Cross arms, pins, and secondary racks

### Net manhours each

| Item | Manhours | |
|---|---|---|
| | 8' | 10' |
| CROSS ARMS | | |
| Single Arm | 1.69 | 1.69 |
| Double Arm | 3.77 | 3.77 |
| Single Side or Alley Arm | 3.50 | 3.50 |
| Double Side or Alley Arm | 5.85 | 5.85 |
| PINS | | |
| Steel Shank with Washer and Nut | .39 | |
| Wood Shank — Nailed | .26 | |
| Saddle Pins | .65 | |
| Pole Top Pins | 1.30 | |
| SECONDARY RACKS | | |
| One Spool | .65 | |
| Two Spool | 1.30 | |
| Three Spool | 1.95 | |
| Four Spool | 1.95 | |
| Rack Extension | 1.30 | |

Manhours include storing, handling, hauling and placing including installation of necessary thru bolts, carriage bolts, double-arming bolts, lag screws, and braces.

Above cross arm manhours are based on a typical crew consisting of foreman, truck driver, two linemen, and two groundmen.

## Primary and secondary protective devices

### Net manhours each

| Item | Manhours |
|---|---|
| PRIMARY | |
| Pole Top Air Break Switch — TPST — with Operating Mechanism and Rod | 45.50 |
| Enclosed Disconnect Switches | 3.00 |
| Open Disconnect Switches | 3.00 |
| Enclosed Cutouts — One Shot | 3.00 |
| Enclosed Cutouts — Two Shot | 3.00 |
| Enclosed Cutouts — Three Shot | 3.00 |
| Open Cutouts — One Shot | 3.00 |
| Open Cutouts — Two Shot | 3.00 |
| Open Cutouts — Three Shot | 3.00 |
| Oil Circuit Reclosers — Single Phase (70 lbs.) | 10.50 |
| Oil Circuit Reclosers — Three Phase (315 lbs.) | 18.00 |
| Heavy Duty Oil Circuit Reclosers — Single Phase (170 lbs.) | 15.00 |
| Heavy Duty Oil Circuit Reclosers — Three Phase (700 lbs.) | 27.00 |
| Oil Switch — Single Phase — Remote Control | 15.00 |
| Oil Switch — One Single Phase — Manual Gang Operated | 18.00 |
| Oil Switch — Two Single Phase — Manual Gang Operated | 39.00 |
| Oil Switch — Three Single Phase — Manual Gang Operated | 65.00 |
| Oil Switch — Remote Control | 65.00 |
| Oil Switch — Manual Operated | 78.00 |
| Lightning Arresters | 2.25 |
| SECONDARY | |
| Fuse Cutouts | 2.25 |
| Lightning Arresters | 2.25 |

Manhours include handling, hauling, and installing protective devices as outlined in above table.

# outside electrical construction - 2

## Pole anchors

### Net manhours each

| Item | Manhours |
|---|---|
| Plate Anchors | 1.30 |
| Expansion Anchors | 1.30 |
| Screw Anchors | 2.60 |

Manhours include complete installation of anchors as outlined above.

Manhours do not include excavation or pole setting. See respective tables for these charges.

For Deadman Anchors apply additional excavation giving due consideration to excavating and soil conditions.

Manhours are average of pole setting and wire stringing crews for this type of work. This is due to the fact that anchors may be set when pole setting crew erects pole or when wire stringing crews place wire.

## Pole mounted distribution line transformers

### Net manhours each

| KVA Rating | Manhours | |
|---|---|---|
| | Single Phase | Three Phase |
| 3 | 8.70 | 30.00 |
| 5 | 9.60 | 31.50 |
| 7-1/2 | 11.10 | 34.50 |
| 10 | 11.70 | 37.50 |
| 15 | 14.70 | 40.50 |
| 25 | 17.40 | 45.00 |
| 37-1/2 | 20.55 | 49.50 |
| 50 | 24.90 | 54.00 |
| 75 | 28.36 | 63.00 |
| 100 | 38.10 | 72.00 |
| 150 | 41.70 | 81.00 |
| 200 | 46.80 | 90.00 |

## Aerial cable

Manhours include handling, hauling, and installing of above listed items.

Manhours based on typical crew consisting of foreman, truck driver, four linemen, two groundmen, and two splicers and helper.

*Single Phase — Primary — Self Supporting Copper* consists of one insulated conductor and one lashed bare neutral messenger.

*Three Phase — Primary — Self Supporting Copper* consists of three insulated conductors and one lashed bare neutral messenger.

*Secondary and Service Drop* consists of two insulated conductors and one bare neutral conductor serving as supporting member.

| Wire Size | Item | Manhours per Hundred Feet, Height to: 25' | 35' | 45' | 55' | 65' | 75' |
|---|---|---|---|---|---|---|---|
| | PRIMARY - PREASSEMBLED - SELF SUPPORTING - COPPER | | | | | | |
| #6 | Single Phase | 11.16 | 11.40 | 11.76 | 12.00 | 12.36 | 12.60 |
| #4 | Single Phase | 12.56 | 12.83 | 13.23 | 13.50 | 13.90 | 14.18 |
| #2 | Single Phase | 13.95 | 14.25 | 14.70 | 15.00 | 15.45 | 15.75 |
| #1/0 | Single Phase | 16.04 | 16.39 | 16.91 | 17.25 | 17.77 | 18.11 |
| #2/0 | Single Phase | 18.14 | 18.53 | 19.11 | 19.50 | 20.09 | 20.48 |
| #4/0 | Single Phase | 20.93 | 21.38 | 22.05 | 22.50 | 23.18 | 23.63 |
| #4 | Three Phase | 25.11 | 25.65 | 26.46 | 27.00 | 27.81 | 28.35 |
| #2 | Three Phase | 27.90 | 28.50 | 29.40 | 30.00 | 30.90 | 31.50 |
| #1/0 | Three Phase | 32.09 | 32.78 | 33.81 | 34.50 | 35.54 | 36.23 |
| #2/0 | Three Phase | 36.27 | 37.05 | 38.22 | 39.00 | 40.17 | 40.95 |
| #4/0 | Three Phase | 41.85 | 42.75 | 44.10 | 45.00 | 46.35 | 47.25 |
| | SECONDARY & SERVICE DROP - SELF SUPPORTING | | | | | | |
| #6 | Polyethylene | 8.37 | 8.55 | 8.82 | 9.00 | 9.27 | 9.45 |
| #4 | Polyethylene | 9.77 | 9.98 | 10.29 | 10.50 | 10.82 | 11.03 |
| #2 | Polyethylene | 11.16 | 11.40 | 11.76 | 12.00 | 12.36 | 12.60 |
| #1 | Polyethylene | 12.56 | 12.83 | 13.23 | 13.50 | 13.91 | 14.18 |
| #1/0 | Polyethylene | 13.95 | 14.25 | 14.70 | 15.00 | 15.45 | 15.75 |
| #2/0 | Polyethylene | 16.74 | 17.10 | 17.64 | 18.00 | 18.54 | 18.90 |
| | | Net Manhours Each | | | | | |
| | DEADENDING | | | | | | |
| | Single Phase | 4.50 | | | | | |
| | Three Phase | 15.00 | | | | | |
| | TOPPING AND SPLICING | | | | | | |
| | Single Phase to Single Phase | 3.00 | | | | | |
| | Single Phase to Three Phase | 4.50 | | | | | |
| | Three Single Phase to Three Phase | 10.50 | | | | | |
| | Three Phase to Three Phase | 13.50 | | | | | |

## Miscellaneous overhead service items

### Net manhours each

Manhours include picking up at storage, handling, hauling, and installing.

Manhours do not include installation or connecting of any items other than those listed above.

| Item | Manhours |
|---|---|
| Secondary Racks | 1.50 |
| Take-Off Insulators | .75 |
| Crossarm Bracket | .75 |
| Angle Bracket | .75 |
| Service Racks | 1.50 |
| Wire Holders | .75 |
| Cable Holders | .75 |
| #1 and Smaller — Openwire | 2.25 |
| #1/0 and Larger — Openwire | 3.75 |
| #1 and Smaller Service Drop Cable | 1.50 |
| #1/0 and Larger Service Drop Cable | 3.00 |

Manhours are based on typical crew consisting of foreman, truck driver, two linemen, and one groundman.

## Distribution regulators and capacitors

Manhours include pick-up at storage, handle, haul up to two miles, hoist, support, fasten in place, and connect.

Manhours do not include installation of protective devices, grounding and switching equipment. See respective tables for these charges.

Manhours based on crew consisting of foreman, truck driver, two linemen, and two groundmen.

| KVA Rating | Item | Manhours |
|---|---|---|
| | REGULATORS | |
| 12-1/2 | Pole Mounted | 18.00 |
| 19 | Pole Mounted | 21.00 |
| 25 | Pole Mounted | 24.00 |
| 12-1/2 | Platform Mounted 3 Phase Bank | 30.00 |
| 19 | Platform Mounted 3 Phase Bank | 33.00 |
| 25 | Platform Mounted 3 Phase Bank | 37.50 |
| 37-1/2 | Platform Mounted 3 Phase Bank | 41.25 |
| 50 | Platform Mounted 3 Phase Bank | 52.50 |
| 62-1/2 | Platform Mounted 3 Phase Bank | 60.00 |
| 75 | Platform Mounted 3 Phase Bank | 67.50 |
| 100 | Platform Mounted 3 Phase Bank | 82.50 |
| 125 | Platform Mounted 3 Phase Bank | 97.50 |
| | CAPACITORS | |
| | One Single Phase Unit | 7.50 |
| | Two Single Phase Units | 12.00 |
| | Three Phase Bank | 18.00 |
| | Two Three Phase Banks | 33.00 |

## Stringing wire

Manhours include storing, handling, hauling up to ten miles, stringing, splicing, sagging, and tieing in for items as outlined in above table.

Manhours are based on typical crew consisting of foreman, truck driver, four linemen, and three groundmen.

| Wire Size | Item | Manhours per Thousand Feet, Height to: 25' | 35' | 45' | 55' | 65' | 75' |
|---|---|---|---|---|---|---|---|
| #6 | Copper, Bare – Copper, TBWP – Copper, Polyethylene – ACSR, Bare – ACSR, TBWP & ACSR Polyethylene | 21.48 | 21.95 | 22.54 | 23.10 | 23.79 | 24.25 |
| #4 | | 22.74 | 23.23 | 23.96 | 24.45 | 25.18 | 25.67 |
| #2 | | 26.78 | 27.36 | 28.22 | 28.80 | 29.66 | 30.24 |
| #1/0 | | 33.76 | 34.50 | 35.57 | 36.30 | 37.39 | 38.12 |
| #2/0 | | 39.48 | 40.33 | 41.60 | 42.45 | 43.72 | 44.57 |
| #4/0 | | 51.06 | 52.16 | 53.80 | 54.90 | 56.55 | 57.65 |
| #6 | Aluminum, Bare – Aluminum, TBWP & Aluminum, Polyethylene | 18.69 | 19.10 | 19.70 | 20.10 | 20.70 | 21.11 |
| #4 | | 19.95 | 20.38 | 21.00 | 21.45 | 22.10 | 22.52 |
| #2 | | 23.99 | 24.51 | 25.28 | 25.80 | 26.57 | 27.10 |
| #1/0 | | 30.97 | 31.64 | 32.63 | 33.30 | 34.30 | 35.00 |
| #2/0 | | 36.69 | 37.48 | 38.66 | 39.45 | 40.63 | 41.42 |
| #4/0 | | 48.27 | 49.31 | 50.86 | 51.90 | 53.46 | 54.50 |
| #6 | Copperweld, Bare | 23.58 | 24.09 | 24.85 | 25.36 | 26.12 | 26.63 |
| #4 | Copperweld, Bare | 28.46 | 29.07 | 29.98 | 30.60 | 31.52 | 32.13 |
| #6A | Copperweld – Copper, Bare | 24.27 | 24.80 | 25.58 | 26.10 | 26.88 | 27.40 |
| #4A | Copperweld – Copper, Bare | 29.57 | 30.21 | 31.16 | 31.80 | 32.75 | 33.39 |

| | Net Manhours Each |
|---|---|
| DEADENING | |
| Insulated Clevis | 1.50 |
| 1 Suspension Insulator & Clamp | 2.25 |
| 2 Suspension Insulators & Clamp | 3.00 |
| INSULATORS | |
| Pin | .45 |
| Post | 1.50 |
| Preformed Arm or Rods (per set) | 1.50 |

# ALLIS-CHALMERS

*Originators of 5/8% Step Regulators*

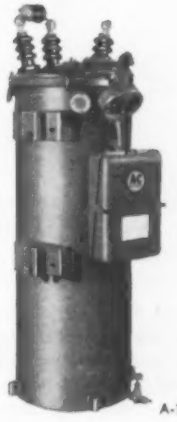
# Hang up the "climbers"!

## New JFR regulators offer safe, ground-level adjustment

**It's standard with Allis-Chalmers!** Position indicator drag hands adjust from the ground at the remote control panel. Saves poles, ends risky pole climbing and makes recording of operation range practical. At the push of a button, indicator *drag hands* are reset on large, easy-to-read face with reflecting numbers and indicator hand.

There's much more for you in this all-new design. It's the most advanced regulator on the market today. New sight indicator gives you fast check of oil level. Newly designed cover, with hidden bushing mounting studs, cuts maintenance. JFR's now lower, lighter . . . slashes transportation, handling and installation charges. Ask your nearby A-C office for new JFR bulletin 21B7977E or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

- External by-pass arrester
- Obstruction-free cover
- Electrical resettable position indicator
- Oil sight gauge
- Feather-Touch control



A-1216

*Feather-Touch is an Allis-Chalmers trademark.*

# New device for high voltage switching

◆ A NEW DEVELOPMENT for high-voltage switching named Circuit-Switcher has been introduced by S&C Electric Company for 34.5 through 138 kv. Circuit-Switcher, resembling a load interrupter switch in appearance but working more like a circuit breaker, is a generic name for a new family of switchgear for handling a number of circuit interrupting duties. It is presently designed for all forms of load switching. Later models are expected to include fault interruption capabilities.

"Circuit-Switcher embodies a new concept in high-voltage circuit interruption. It's a cross between a load interrupter switch and a circuit breaker," explained John R. Conrad, S&C president. "From the load interrupter," he said, "Circuit-Switcher derives its looks. It mounts like a load interrupter. It is opened and closed like a load interrupter. It isolates circuits visibly with air like a load interrupter.

"But," Mr. Conrad continued, "like a circuit breaker, Circuit-Switcher carries current continuously through its interrupting unit. Its vital close-and-trip mechanisms are fully enclosed and protected. Like a breaker, it trips from stored energy, but the energy is stored within Circuit-Switcher. Also, like a circuit breaker with its trip-free feature and latch-check switch, Circuit-Switcher has positive sequence control built into its mechanism."

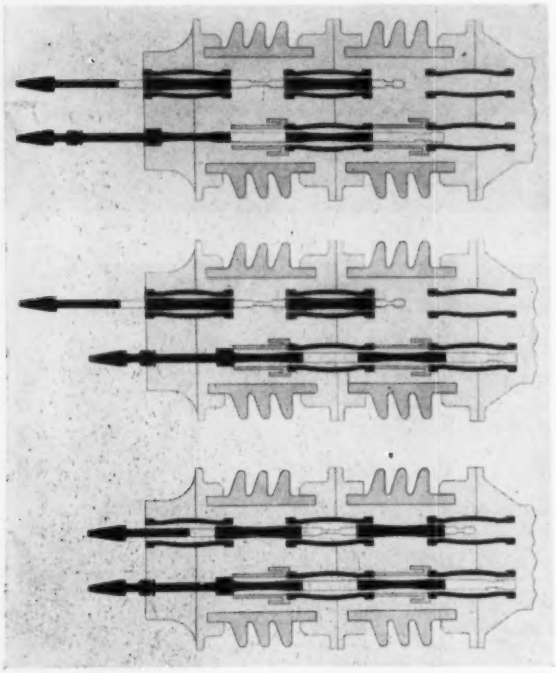
### Tailoring capabilities

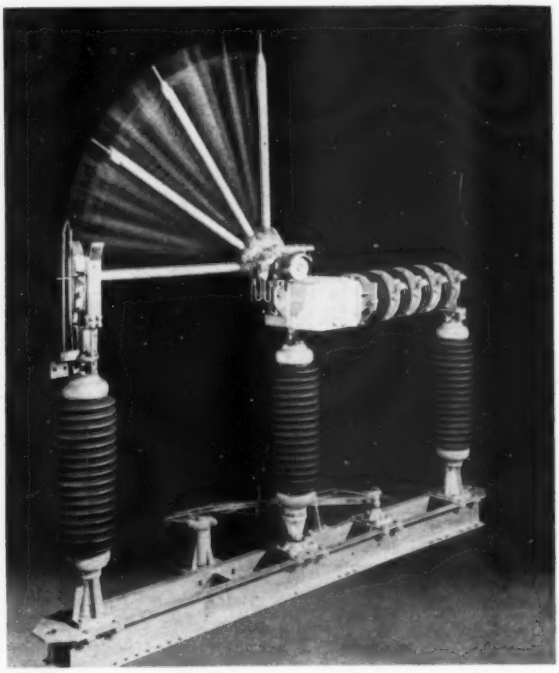
Severity of high-voltage switching duty varies widely with magnitude of the recovery voltage transient following current interruption for the many different applications for circuit interrupting devices. By segmenting switching duty according to severity and by putting the Circuit-Switcher interrupting section into modular form, S&C introduces the idea of tailoring circuit interrupting devices to fit specific applications within a given voltage class, Mr. Conrad explained.

A Circuit-Switcher can be seselected that has just the number of interrupting units actually required. No more switching capability has to be bought than is needed. Ability to withstand recovery voltage can be matched to system recovery voltage characteristics through building up the proper number of modular units in series.

Eight major application classifications have been established, including such duties as transformer switching, load dropping, load

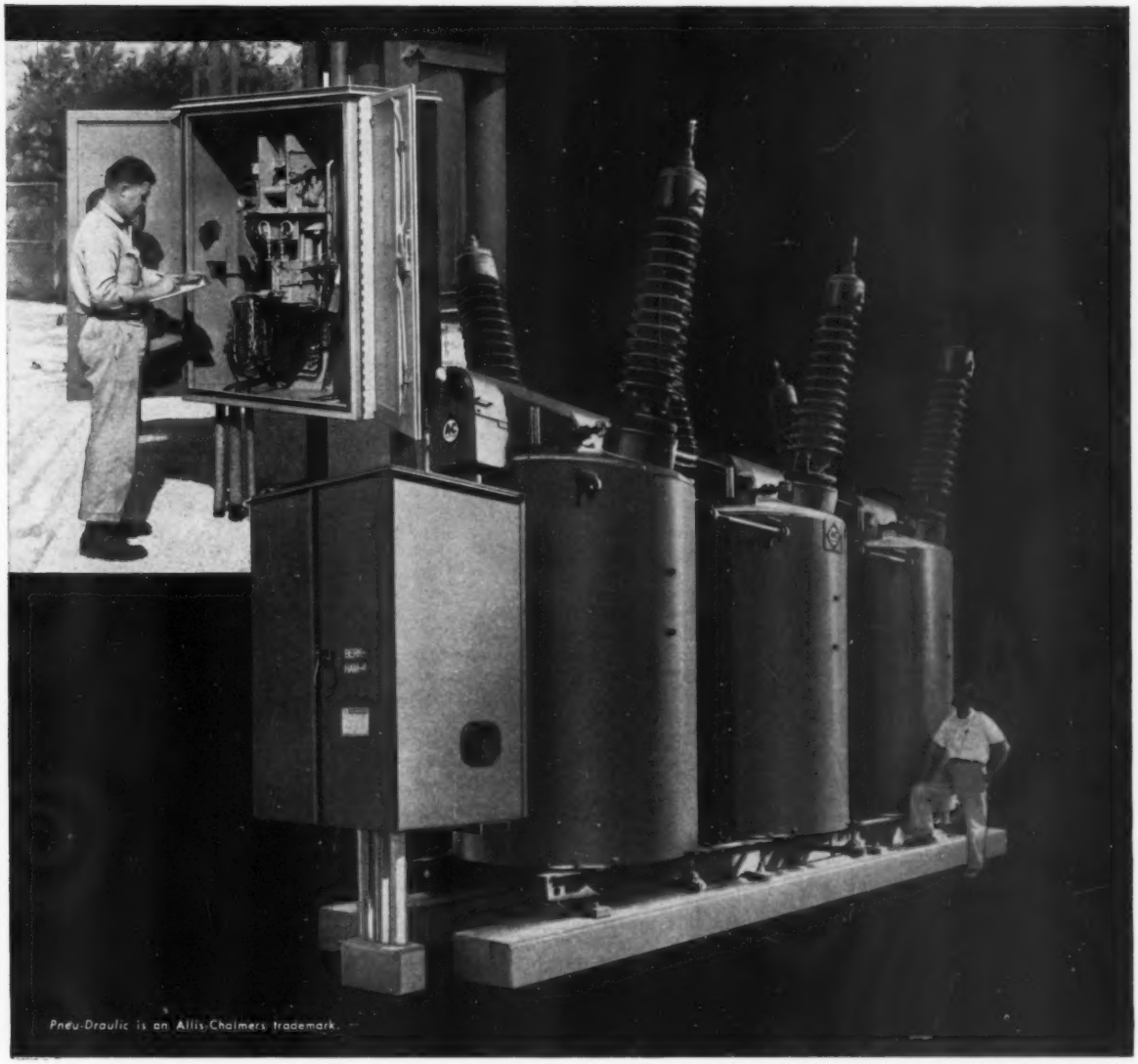
*(Continued on page 131)*





**(Left) Schematic diagram of interrupting unit of the new S&C Circuit-Switcher which hybridizes breakers and interrupters. In upper drawing the load and high-speed rods are both in conducting position. The next view shows the heavier, more massive load rod beginning to move to the open position. The lower sketch shows the high-speed rod moving to open position. Both rods return to conducting position after the isolator is fully open. (Right) A typical Circuit-Switcher showing isolator and the load interrupter for a single phase. The units are rated 34.5 kv to 138 kv and can be tailored to various switching capability.**

# ALLIS-CHALMERS




This installation is repeated on 160 power systems.

## It's well underway...the big swing to breakers with Pneu-Draulic operators

**Here's how confidence adds up.** An innovation scarcely six years old has won the acceptance of 160 companies — and over 60% have placed repeat orders. That's the dramatic record of the reliable *Pneu-Draulic* operator available on Allis-Chalmers outdoor breakers (14.4 to 345 kv, 500 to 25,000 mva).

**Reliable stored energy** assures safe emergency closing of breaker at full rated speed onto energized line (even when no control power is available). Use of non-compressible oil instead of air ends use of trouble-causing anti-freeze solutions, eliminates moisture and corrosion problems. And, you get these additional benefits — mechanically trip-free operation, high-speed interruption.

Join the big swing to A-C breakers with low-maintenance *Pneu-Draulic* operators. Call your nearby A-C office or write **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wisconsin.

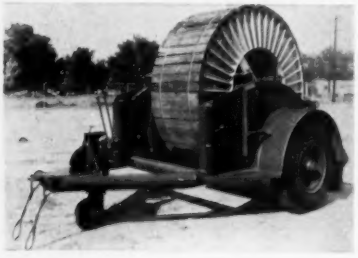
A-1249

# Notes on new utility equipment

## Modified carrier accepts reels up to 62 inch width

TRUCK EQUIPMENT Co., 3963 Walnut St., Denver, Col., announces the production of a new modified reel carrier which accommodates reels up to 62 inches in width.

A newly designed axle, wheel and hub assembly enables this standard Truco trailer to accept the larger reels. The 8-inch increase in inside width permits the Model TCR to accept at no increase in cost the



wider reels now being produced by cable and conductor manufacturers.

The Truco modified trailer will handle reels of 96 inches diameter and up to 14,000 pounds. Also available on special order are trailers to handle reels up to 108 inches diameter, 72 inches wide with a 20,000 pound capacity. These feature the Truco hydraulic system driven by a separate power source.

As an optional accessory, Truco can supply payout tensioning and power pulling equipment to any of these trailers for the stringing of cable and conductor under tension.

**Write U-409 on reply card, pg. 17**

## Lightning arrester line includes rating of 121-kv

LINE MATERIAL Industries, McGraw-Edison Co., Milwaukee, Wis. line of intermediate-class, Type F lightning arresters has been extended to include ratings of 90, 97, 108, and 121 kv.

Type F arresters combine compactness and simplicity of design with stability of operation and excellent discharge - voltage and impulse-sparkover characteristics. Power frequency sparkover values are virtually identical under wet and dry conditions and are well above industry standards.

Welded tubular-aluminum grading rings prevent radio noise and assist in establishing a stabilized and equalized 60-cycle voltage distribu-

tion. Power follow current is limited to low values and is effectively interrupted by a simple gap structure. Each Type F arrester is equipped with a positive venting device. In rare instances when an arrester fails, high-pressure gases are vented to the atmosphere, assuring maximum safety to surrounding personnel.

Additional features of Type F arresters are high-grade wet-process porcelain housings, permanent moistureproof seals, aluminum alloy castings, and two-bolt clamp-type terminals.

**Write U-410 on reply card, pg 17**

## Load indicator monitors distribution transformers

A NEW LOAD indicator (type TL) designed for new or existing distribution transformers has been developed by the Westinghouse Electric Corp. Box 2278, Pittsburgh, Pa. Presently, the load indicator is available for 25-kva distribution transformers; ratings from 5 through 50 kva will follow.

The new unit can be mounted and connected outside the transformer tank. It makes possible the selective monitoring of loads across an entire

system with minimum cost and time. In fact, and with the proper lead connections, it is possible to mount the indicator on the pole or elsewhere for remote monitoring.

Basically a signal light demand-type meter modified to follow the effect of ambient temperature on the transformer, the TL indicator will: (1) show effective demand on the transformer, (2) bypass momentary peaks caused by faults or short overloads (such as inrush current of motor starting), but respond to larger overload peaks, and (3) indicate economic load limit beyond which excessive losses will result in loss of revenue as compared to the use of a larger kva transformer, or adding another unit.

An internal element of the new indicator is designed so that it is magnetically heated in proportion to transformer load by the magnetic field surrounding the current-carrying conductors outside the tank.

Its response characteristic results in a temperature rise which closes contacts at a predetermined load level to energize a signal lamp for economic load limit indication. This load level may be adjusted in the field.

**Write U-411 on reply card, pg. 17**

## Phase sequence indicators for circuits up to 480 volts

THE OPAD Electric Co., 43 Walker Street, New York 13, N. Y., has introduced a new low cost phase sequence indicator for rapid determination of the order in which the voltage peaks of a multiphase power supply occur.

The Model VA2 is a compact light weight instrument designed for direct connection, without switching,

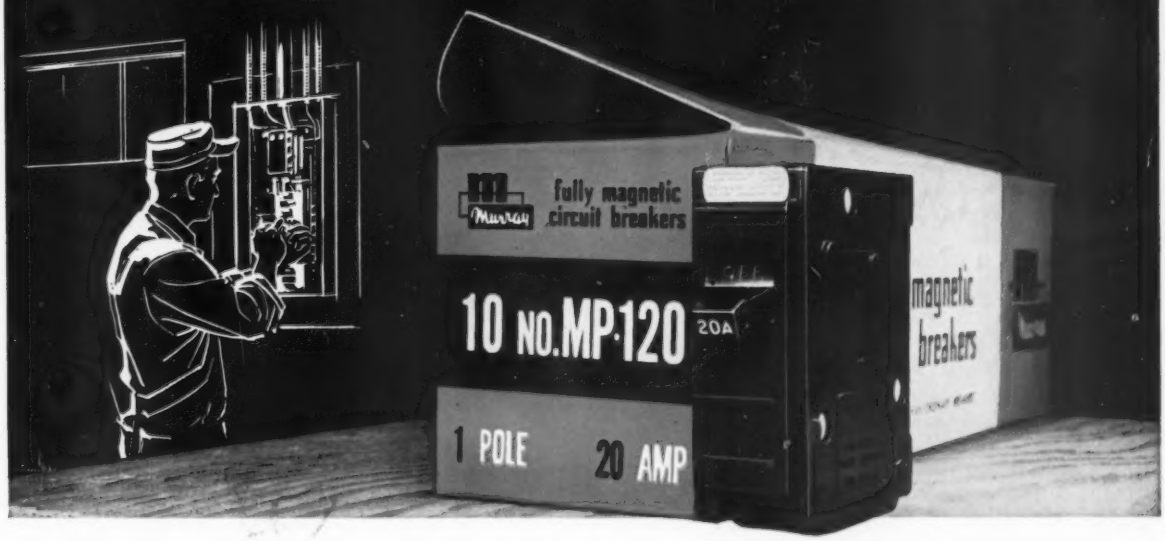
to polyphase circuits with voltages between 104 and 480 volts. The frequency range of the instrument is from 30 to 1000 cycles.

Oil tight panel components are employed for maximum reliability under adverse environmental condi-

fully magnetic, competitively priced . . . and now

# GUARANTEED FOR LIFE

## Murray "MP" Circuit Breakers



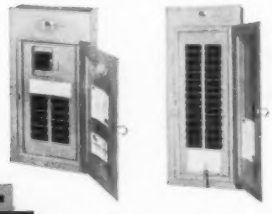

**Build Business, Profits, Prestige!**
Install the breaker that's best all around—best for you, best for your customers, and *Guaranteed For Life!*

You'll like working with "MP" breakers. *Fully magnetic* and unaffected by heat, these breakers never need derating, carry full rated load, never trip unnecessarily, can be installed anywhere it's most convenient for you or your customers.

Secondly, your customers will appreciate knowing that the breakers you install are *Guaranteed For Life.* It shows you're using the best, helps you get the business.

**Extra Sales Aids For You!**
You get a special Guarantee Certificate to leave with each customer plus a special sticker for your own promotion to use on each load center. This will boost your prestige, bring extra business your way.

**Here's How You Can Cash In On This Guaranteed For Life Program!**
See your Murray wholesaler today for full information on this precedent-breaking promotion. Ask him also about the material he has available to help you sell builders and homeowners on Murray *Guaranteed For Life* "MP" circuit breakers. Or write Murray directly for complete details.



60 TH YEAR Murray

**Backed By A Full Line Of Load Centers**

**Murray Manufacturing Corp., 1250 Atlantic Avenue, Brooklyn 16, N.Y.**
Dept. E-4

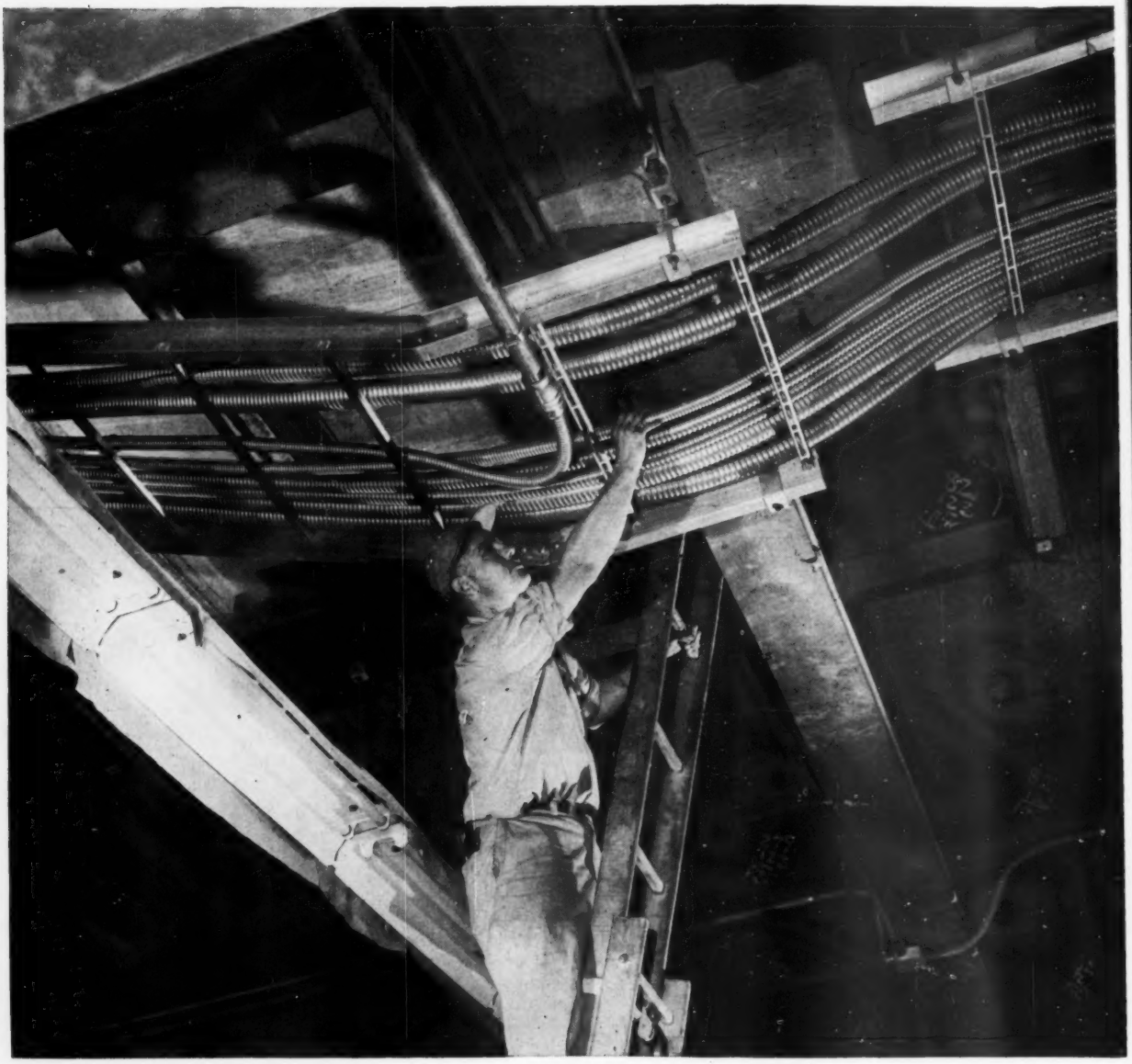
Gentlemen:

A circuit breaker that's *Guaranteed For Life!* I'm interested. As soon as possible, send me complete information on everything.

Name_____

Address_____

My wholesaler is_____



**Armorlokt Cables** are easy to install around bends or obstructions, readily accessible for repairs and are available for indoor and outdoor applications.

USS

# Tiger Brand Electrical Wire & Cable

**A standard cable for every special job**

- Asbestos Wire and Cable
- Mold-Cured Portable Cord
- Shovel & Dredge Cable
- Paper & Lead Cable
- Varnished Cambric Cable
- Interlocked Armor Cable
- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable

# What's the difference in electrical cable?

## You can install USS Armorlokt in half the time—at half the cost

Take a close look at the main illustration. With Tiger Brand Armorlokt Interlocked Cable, it's a simple job to run power and light lines around a steel beam. We know, from experience on other jobs, that a conduit system would require about twice as much time to install. It would probably have required larger size cable, because of the higher voltage drop . . . *and it would cost about twice as much!*

*Greater current-carrying capacity.* For a given conductor size, Armorlokt will have a higher current capacity than three single conductor cables pulled into a steel conduit. As an example, 500 MCM 3-conductor varnished cambric cable with galvanized steel interlocking armor will have a current-carrying capacity of 417 amperes with a copper temperature of 85°C. Three single conductors of the same size in a steel conduit will have a current-carrying capacity of 380 amperes. Putting it another way, 350 MCM Armorlokt might serve, where 500 MCM would otherwise be required in conduit . . . a big saving in favor of Armorlokt.

*Less material—less space.* With Armorlokt, costly pipe fitting, bending and pull boxes are eliminated. Installation time is cut approximately in half. Space savings as high as 55% to 75% over conduit are common.

*Greater layout flexibility.* When distribution systems are laid out with easily-accessible, readily-traceable Armorlokt Cables, it is a simple matter to change machinery locations. This might well be a deciding factor in industrial plants.

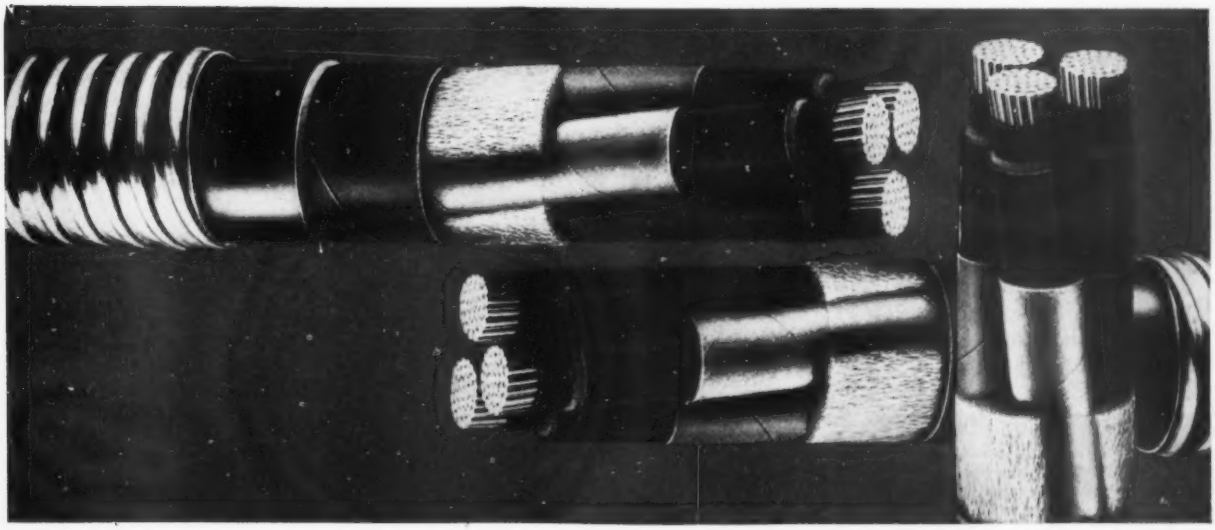
*Ease of maintenance.* Armorlokt Cable permits the greatest possible ease of maintenance. Cable faults are readily located and serviced. If Armorlokt should become damaged, you simply insert a splice box.

USS Tiger Brand Armorlokt Cable is available in voltage ratings from 110 to 15,000 . . . with galvanized, stainless steel, aluminum or bronze armor . . . with polyvinyl chloride jackets over the armor for especially corrosive applications. For complete facts, write American Steel & Wire, Dept. 0190, 614 Superior Avenue, N.W., Cleveland 13, Ohio.

*USS, Tiger Brand and Armorlokt are registered trademarks*

**American Steel & Wire Division of United States Steel**

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad



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"Superforms* help us clip in transmission lines Better, Faster, for Less" ...CONTRACTOR

"When we bid on a T&D job, we have to figure *cost, speed, quality* and a *fair profit.* Since we started using Superforms, we've eliminated many former errors and inconsistencies in practices.

"We stake our reputation on results . . . Fanner products help us get best results."

Successful Contractors are the men who can build TOP quality at LOW cost. From coast to coast they are switching to Fanner Superforms. A-1604A

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**ARMOR RODS...** Protect long-span T&D lines at supports

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**PATCH RODS...** Repair damaged conductors

**TAP ARMOR...** Protects conductor at tapping points

**FANNGRIPS...** For dead-ending strands and conductors

**FANNSPLICES...** Join two ends of conductor wire

**PLASTIC PRODUCTS...** For conductor surface protection

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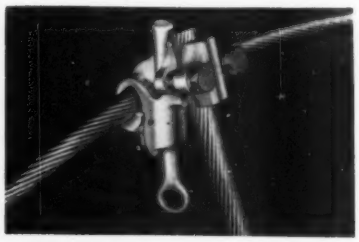
tions. Connections are made by means of three 36 inch oil resistant rubber covered test leads with insulated clips. Leads are marked at both ends for positive identification and are securely anchored to the instrument with strain-relief fittings.

The instrument is entirely self contained in a high resistance case 6¼ x 3¾ x 3¼. Weight is only 1½ pounds.

**Write U-412 on reply card, pg. 17**

## All-aluminum tap clamp cuts corrosion problems

A. B. CHANCE Co., 210 N. Allen St., Centralia, Mo., is now marketing a tap clamp of all aluminum construction, which accommodates main line and jumper wires up to 397.5 MCM ACSR. The all-aluminum tap clamp was designed for making aluminum-to-aluminum taps and is particularly



advantageous in marine and industrial areas where problems of corrosion are severe.

These new protected connection clamps have extra wide clamp jaws which make maximum contact with the outside strands of the main line conductor. A special "waved" main line contact shape assures making low resistance contacts on clean, or even moderately oxidized conductors.

The main line conductor size range for Chance all-aluminum clamps extends from No. 2 ACSR to 397.5 MCM ACSR with the tap maximum size being the same as that of the line conductor. The minimum tap size is No. 4 solid. A flip-over terminal cap enables the clamp to accommodate the minimum tap conductor size.

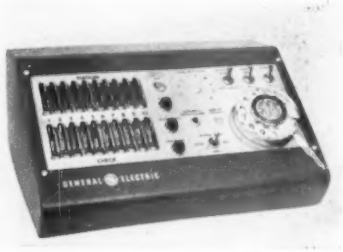
**Write U-413 on reply card, pg. 17**

## Alarm control system monitors remote areas

DESIGNED PRIMARILY for utilities, pipelines, railroads and similar companies which monitor and control unattended locations remotely from a central control point, a new alarm control system has been placed on the market by General Electric Communication Products Dept., Lynchburg, Va.

The new equipment may be used with various types of transmission media, such as microwave, carrier current, or wire lines. The control signals employed are in the form of tones which provide communication between the control point and remote locations. They may be used to check a single location or as many as 100 different points.

Ten functions may be checked at each point. The signals will indicate whether a certain pre-scheduled



action is taking place at a remote location or whether faults have occurred.

At the control terminal, a small console is mounted on the operator's desk and a cable connects this with rack-mounted tone equipment. The console has a bank of 10 indicator lamps to show the stations being selected and a second bank to show whether any faults are present. A dial is employed to select and check the desired station and to operate remotely-controlled equipment at unattended distant points.

At the unattended station, the tone equipment is mounted in standard relay racks and requires only two panels 3½ inches deep. One panel has switching equipment for remote selection and the second contains the tone receiver and power supply.

**Write U-414 on reply card, pg. 17**

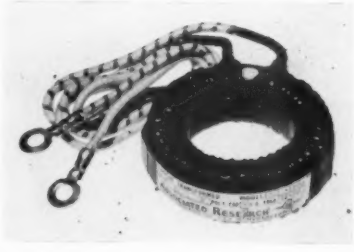
## Donut current transformers extend range of ammeters

A NEW SERIES 700 line of "Donut" current transformers for metering and allied applications has just been announced by Associated Research, Inc., of 3777 W. Belmont Ave., Chicago 18, Ill.

These transformers are used for extending the range of ammeters, as well as for providing operating current for relays.

The new Series 700 current transformers are available in ratios from 10/5 to 5000/5, with burden ratings of 2.5 to 12.5 kv.

**Write U-415 on reply card, pg. 17**



### Oil-free bushing reduces radio noise, interference

A NEW BUSHING, announced by Kuhlman Electric Co., 2565 E. Maple Rd., Birmingham, Mich., offers a positive means of reducing radio noise and interference without oil.

A stress relieving ground sleeve, usually found only on power transformer bushings, encases the bushing shank. The sleeve's greater surface eliminates the concentration of stresses that could cause radio noise.

Other features of the new Kuhlman bushing are a full-protection hand grip, allowing line connections without need for tools; new design

and construction of porcelain with heavier, stronger skirts; spring loaded terminal accommodating a wider range of aluminum and copper conductors; and new internal clamping that eliminates all external hardware.

In addition, the new Kuhlman disconnects permit disconnection of the bushing without use of tools. A quick, easy quarter turn of the disconnect at the base of the bushing frees the bushing lead.

**Write U-416 on reply card, pg. 17**

### Red warning flag markers tag electrical hot spots

A NEW RED flag safety marker to tag hot spots in electrical work is on the market from Bodendieck Tool Co., Route 48 North, Taylorville, Ill.

Attached with an extending hot stick, these new flags were first used for substation paint crews who wanted a warning device to remind them where to stay clear. The flags are non-conducting, and are attached to metal clamps that snap onto the conductors.

Basically, the flag is used as a visual warning that the part and its continuation are energized. Normally, flags are attached to the nearest hot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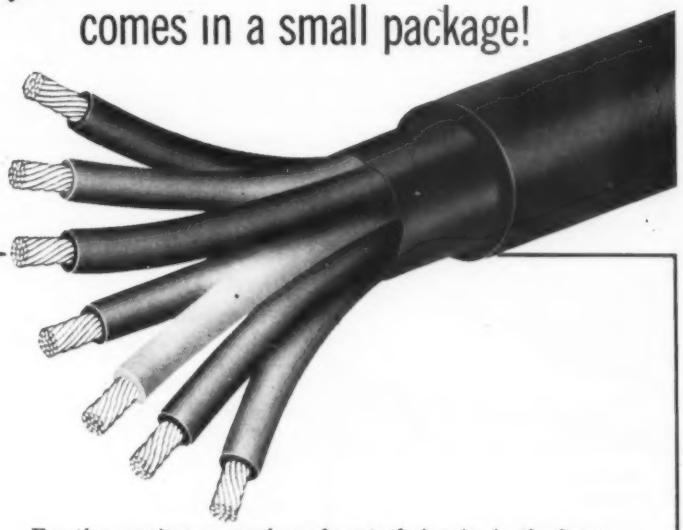
**SUPERIOR SD CONTROL CABLE...**

**QUALITY**

comes in a small package!



For the maximum number of control circuits in the least amount of space... top quality SUPERIOR SD Control is the answer.

Overall diameters are reduced by as much as 20% to 35% *without* any sacrifice of reliability in performance!

High quality polyethylene, armored with tough nylon, insulates the flexible, stranded conductors. Color-coding to meet your requirements. Non-hygroscopic tape covers the core... and the smooth, neat jacket of durable polyvinyl chloride has excellent resistance to oils, alkalies and solvents. Conduits are not needed.

For performance and economy... for more circuits in less space... use high quality SUPERIOR SD Control Cable.

*For complete information and prices, write*

**SUPERIOR CABLE**

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Hickory, North Carolina

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Fine Fanner Superformed Products

"Superforms* help me get better results for my clients" ...CONSULTING ENGINEER

"It's my responsibility to get the best possible results for my clients . . . the most for their T&D construction dollars . . . installations that will stand up under severest conditions, over long periods of time. Fanner Superformed products help me meet these requirements."

More and more Consulting Engineers are making Superforms a standard in their specifications. A-1601A

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**TAP ARMOR...** Protects conductor at tapping points

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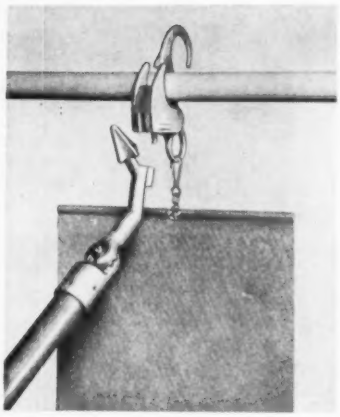


bus or switch before work is begun. A slight breeze puts the flag into motion, emphasizing visual warning and creating an audible signal as well.

For clamping conductors, the jaws of the flag's clamp are cocked open by hand. A slot in the clamp is then engaged by the installer on the hot stick. When the jaw opening is thrust against the conductor, the trigger trips, and spring action clamps the jaws together.

The jaws will clamp a large or small conductor; with enough spring pressure to hold; however, a light, quick pull removes the clamp easily.

**Write U-417 on reply card, pg. 17**

## Steel switch houses give neatness, safety protection

FOR SAFETY, and for scenic-conscious resident customers of a Missouri utility, engineers of Delta-Star Electric Div., H. K. Porter Co., Inc., 2437 Fulton St., Chicago 12, Ill., designed and built 19 neat steel switch houses. Each has a slanting roof designed for compactness, which also prevents accumulation of rain or snow. A three-phase disconnect switch with Powerupters (enclosed-type interrupters) rated 600 amperes at 34.5 kv., was installed. Provision was also made for potential transformer, lightning arrester, 3 incoming lines and 3 load side bushings.

With switch installation, the house weighs some 4,000 pounds and measures 9-feet, 7-inches high, 6-feet, 8-inches deep, and 8-feet, 6-inches wide. Transportable by truck, each house was equipped with roof brackets for lifting it into position on a concrete slab, and for attachment of take-off towers.

The switch is motor operated by a mechanism attached to either the right or left side of the house. Locked mechanism, bolted doors, and sealed windows provided complete safety.

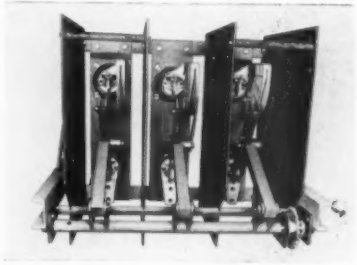
**Write U-418 on reply card, pg. 17**

## Frame-mounted load breaker interrupts and disconnects

INTRODUCTION of a new frame-mounted, manually-operated load-break switch, Type LBS, which incorporates the functions of a disconnecting switch and a circuit interrupter for interrupting transformer magnetizing and load currents has been announced by Allis-Chalmers, 938 S. 70th St., Milwaukee 1, Wis.

The new three-phase, single-throw, gang-operated switch with a quick-break blade and arc chute interrupter is available as an unfused or fused arrangement for housing in indoor cubicles. It is offered in ratings 4,800 and 13,800 volts capable of interrupting 400 or 600 amperes normal load, and momentary values up to 20,000 and 40,000 amperes respectively.

It can be provided with a direct-drive operator for side-of-cubicle mounting and a chain-drive operator



for front of cubicle mounting. Available for both operators is a quick make mechanism provided for by powerful stored energy springs.

Both operators have provisions for padlocking the switch in either the full-open or full-closed positions.

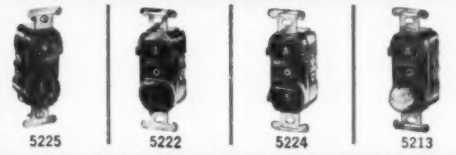
The new load-break switch is suitable for transformer primary switching in unit substations, for service entrance switching, for throw-over from preferred to emergency circuits, for loop circuit sectionalizing, and for isolating plant feeders.

**Write U-419 on reply card, pg. 17**

*The most important wiring devices*
*for any installation*
*...from* **LEVITON**

**Flush Tumbler Switches.** Over 60 cataloged types are available, including 15 and 20 Amp AC Quiet, 10 and 20 Amp T-Rated AC-DC, and 10 Amp residential switches... backed by Leviton's reputation for superior quality at sensible prices.

**LEVITON**




**Combination Line.** Over 30 different cataloged combination duplex devices available. Quiet AC Switches combined with Parallel or U-Ground outlets, Pilot Light, or Duplex Switches in separate or common circuits. AC-DC switches in the same combinations.

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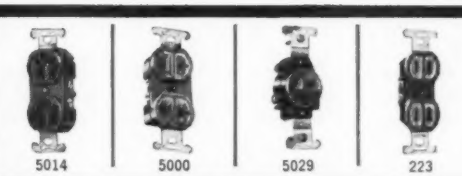


**Single and Duplex Receptacles.** Over 40 different cataloged types. Single and Duplex U-Ground, T-Slotted, Tandem and Parallel, double contact, back and side wired, and Quickwire for heavy duty and residential uses.

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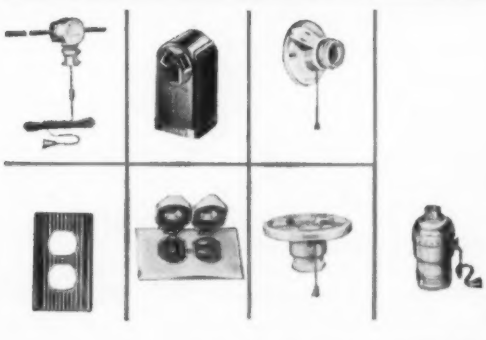
**Lev·O·Lock Devices.** 2, 3, and 4 wire single and duplex receptacles, connectors, caps, and motor plug outlets. Midget 2 and 3 wire caps and cord connectors. For safety, dependability, economy.



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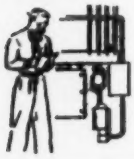

# Understanding the Code

By Walter R. Stone

This article should be especially helpful to the following readers:

Electrical Contractors ✓
Electric Utilities ✓
Electrical Wholesalers ✓
Electrical Inspectors ✓
Industrial Engineers ✓
Consulting Engineers ✓

◆ WE BEGIN our discussion this month about a wiring method which is considered by many electricians to be the best available — rigid metal conduit as defined by Article 346. This system does have many advantages. It also has a few disadvantages. The perfect wiring method has not been devised, but certainly rigid metal conduit is one of the best now in use.

Almost all conduit was made of steel until very recently when aluminum conduit came into use. Brass, bronze, copper, and Everdur steel conduits are used only occasionally and then usually in corrosive locations. In some particularly corrosive locations, steel conduit with special plastic coverings are installed. The use of aluminum conduit was very gradual at first, but now it is used in considerable amounts, though not yet as extensively as steel.

Rigid metal conduit, like any permanant raceway system, has the advantage over cable in that wires can be withdrawn and replaced at comparatively small expense without disturbing the building structures or finishes. It provides excellent mechanical protection for the wiring, it can be installed in exposed as well as in concealed locations, it can be used with approved fittings and boxes in hazardous locations, it has a pleasing appearance when neatly installed, and if installed in a workmanlike manner, it provides a reasonably low impedance ground return path for fault currents. It is one of the safest wiring methods, provided that it is correctly installed.

### Potential hazard

One of the greatest hazards to safety in the use of rigid conduit, which exists also in the use of EMT, Type MI cable, armored cable, and any other wiring method where the metal raceway or metal armor is permitted by Section 250-57 (a) to be used as the equipment grounding conductor for fixed equipment, is the use, or rather the misuse, of locknuts. (Non-metallic wiring methods which are grounded and which have equipment grounding conductors as provided by Section 250-57(b) are not permitted to depend upon locknuts for ground continuity and conductivity. These grounding conductors should be connected to boxes by means of screws, lugs, or clamps according to the provisions of Section 250-113.)

Where threaded hubs and connections are used, this problem is eliminated. (Threaded joints are required in certain hazardous locations.) For potentials exceeding

### Code test questions

1. Rigid metal conduit, except for ferrous raceways which are protected from corrosion solely by enamel, may be used under all atmospheric conditions and in all occupancies. True or false?

2. The radius of the curve of the inner edge of any field bend in rigid metal conduit shall be not less than six times the trade size of the conduit. True or false?

3. Rigid conduit, as shipped, shall be in standard lengths of 10 feet exclusive of the coupling. True or false?

4. Although steel conduit interiors are prepared specifically as raceways, such interiors are not required to be readily distinguishable from galvanized water pipe interiors. True or false?

5. EMT, when run underneath and within 18 inches of a cinder fill, shall be encased on all sides in non-cinder concrete at least 2 inches thick. True or false?

6. Rigid metal conduit protected from corrosion solely by enamel:

(a) may be used only indoors and in occupancies not subject to corrosive influences.
(b) shall not be used.
(c) may be used either indoors or out of doors.

Which is correct? a? b? or c?

7. Electrical metallic tubing protected from corrosion solely by enamel:

(a) may be used only indoors and in occupancies not subject to corrosive influences.
(b) shall not be used.
(c) may be used either indoors or out of doors.

Which is correct? a? b? or c?

8. Rigid metal conduit and EMT, when installed in dairies, laundries, canneries, and similar locations where walls are frequently washed, shall be mounted so that there is an air space between the conduit or tubing and the supporting surface of not less than:

(a) ¼ inch.
(b) ½ inch.
(c) ¾ inch.

Which is correct? a? b? or c?

9. The maximum trade size permitted by the Code for EMT is:

(a) 6 inches.
(b) 4 inches.
(c) 2 inches.

Which is correct? a? b? or c?

10. The provisions of the Code:

(a) permit EMT to be either oval, eliptical, or circular in cross section.
(b) require EMT to be circular in cross section.
(c) have no cross-sectional requirements for EMT other than for size.

Which is correct? a? b? or c?

*Correct answers will be found at end of article on page 100.*

# Second Plant in Mississippi Is Tribute to L & P's Rapid Growth

LIGHT & POWER Utilities Corp., Memphis, Tenn., has done it again! Forced by rapidly expanding business to double their facilities four years ago . . . forced to re-double them only two years ago. . . L & P now has built a whole new second plant at Olive Branch, Miss., that will actually triple existing facilities.

The new factory, 28 miles from L & P's first plant, will cost about $600,000.00, and will provide badly needed additional manufacturing space, as well as extra facilities for administrative offices. There is ample room for further expansion, according to Murray Reiter, L & P, president.

Construction has been going on for the past eight months, slowed somewhat at first by the steel strike and then by the unusually bad weather this winter.

Opening Day festivities are now tentatively set for May 21. Taking part in official ceremonies will be the governor of Mississippi, the mayors of Memphis and Olive Branch, and other officials of the two states and two cities in which L & P is now located.

Both L & P fluorescent fixtures and Delta incandescent fixtures will be manufactured in the Mississippi plant, Mr. Reiter said. They are presently distributed in 38 Southern states and many foreign countries.

Officers of the company, in addition to Mr. Reiter, include Nathan Tamm, P. E., Executive Vice President; D. W. Hawkins and T. R. Salomon, Divisional Sales Managers; Dudley Pou, Production Manager, Fluorescent Division; and Howard Greene, Production Manager, Delta Incandescent Division.

Affiliated companies of Light & Power Utilities Corp. are L & P Fluorescents, Delta Incandescents, Locust Lighting, and Ceiling Materials Co.

# A Statement of Principle

(Several years ago, when we expanded our L & P plant in Memphis, we made the following "Statement of Principle." Now we are happy to repeat it—for our huge new plant in Olive Branch, Mississippi, is the most eloquent proof possible of how sound our principles are.)

Light & Power Utilities Corporation has enjoyed a phenomenal growth since its establishment in 1945. Today, as in the past, we are dedicated to the basic creed that has made this growth possible: the continued building of our business through the fulfillment of the expectations of the contractor, distributor, architect and engineer.

Our factory is manned by qualified engineers and mechanics, who have tools of the highest quality to enable them to do their tasks well.

The Light & Power line of fixtures is wide and varied, with ample stocks maintained to assure prompt delivery. In addition, we offer a special work department for samples and special designs.

Our past experience and our testing laboratory give double assurance to the user that in every instance he will receive quality, economy, and service packed into the carton with every L & P fixture.

The growth of Light & Power is the result of thousands of satisfied customers. We pledge ourselves to seek constantly to improve our product and our service by continuously trying to improve our production facilities and our engineering.

LIGHT & POWER UTILITIES CORP.

1035 FIRESTONE BLVD. • MEMPHIS, TENNESSEE

OLIVE BRANCH, MISS.

250 volts, double locknuts are required by Section 250-75 unless other bonding methods are used. For services, locknuts, whether single or double, are not permitted to be used as the sole bonding means by Section 250-72.

Engineers frequently specify double locknuts even where single locknuts are permitted by the Code in an effort to overcome at small expense the potential hazards of loose connections in the extremely important ground return path which are so often caused by loose locknuts. The small extra expense of a separate grounding conductor is considered in many cases to be well justified because of the added safety which this provides.

Two locknuts are required by Section 373-6(b) where bushings are of the insulating type. A great many inspectors feel that two locknuts should be required by the Code in every case where they are used. Many contractors use double locknuts because they have found that the price for doing so is usually no greater than the cost of adjusting the connections so that a bushing and one locknut will make a tight joint.

As mentioned above, what has been said here about the misuse of locknuts applies also to other wiring methods as well as to rigid conduit. This weak point in conduit and other wiring methods has been emphasized to this degree because it is such a common offender and because, superficially, it appears to be of small consequence. Actually, such connections when poorly made reduce the effectiveness of overcurrent devices, are potential sources of arcing, and result in differences of potential between various non-current carrying parts of the electrical system and between these parts and ground.

### Give threads attention

Another area of a conduit system which deserves special attention is the threads. On steel conduits, the threading removes the galvanized or other protective coating. Some factory threads contain a protective coating; but conduits which are threaded in the field are vulnerable to rust and corrosion. Couplings and connections do not always protect all of the threads. For this reason, threads should receive field attention at the time the conduit is installed if installed out of doors or in other damp locations and particularly where installed in corrosive locations or where buried directly in the earth.

A protective coating, such as white lead or red lead, can be applied easily and quickly in the field with a small paint brush as the conduit is installed in the same manner that "dope" is applied to pipe threads by plumbers.

White lead is usually preferred for this purpose because it is more readily distinguished from red insulating paints which are frequently applied to taped joints and which may be used on the same job site. Electricians have been known to apply the insulating paint to conduit threads. When this is done, the paint insulates the sections of conduit from other sections and from ground. This creates a hazard and should be guarded against. Therefore it is desirable to have contrasting colors between insulating paint which is to be used for taped conductors and lead coating which is to be used for conduit threads, especially where both are used on the same job.

Conduit which is installed in dry indoor, noncorrosive locations, especially if painted after installation, seldom needs special protection for the threads.

### Aluminum thread treatment

The threads of aluminum conduit present an entirely different problem from that presented by steel conduit. Aluminum oxidizes immediately after threading. This action provides a coating which, although invisible, helps to protect the aluminum from corrosion. At the same time, however, this coating also acts as an insulator which tends to insulate the sections of conduit from each other and from ground.

To counteract this insulating effect, a coating of vasoline or of some patented oxide inhibitor should be applied to the threads, and then the threads must be drawn up very tightly. If they are allowed to remain loose, the oxide will reform. But if drawn up tightly, the friction removes the oxide, the inhibitor fills any voids, and the oxide cannot reform. The joint is then properly conductive.

Such a joint will frequently "freeze" (seize) and be very difficult to unscrew without damage to the raceway. Seizing is less likely and a much better joint will result if the more tapered pipe threads are used instead of the relatively straight conduit threads. If locknuts are used, special care is recommended.

Steel conduit increases the total impedance of a circuit by inductive reactance and, in common with other similar enclosures, prevents the dissipation of heat as rapidly as it would be dissipated in free air. Where very large conductors are used in steel raceways, the reactance increases the voltage drop appreciably above what the drop would be on a d-c circuit having ohmic resistance only. Aluminum conduit adds much less reactance than steel when enclosing a-c circuits.

### Corrosion problems

Steel is generally less adversely effected by acid soils when buried in the earth. It is always better to encase underground steel raceways in standard mix concrete or to coat it with asphalt base paint or a similar protective coating. Aluminum conduit should not be buried in the earth without such protection. Neither steel nor aluminum is permitted by the Code to be installed within 18 inches of cinder fill or cinder mix concrete unless protected on all sides by at least 2 inches of standard mix non-cinder concrete.

Section 346-1 states, ". . . Conduits and fittings exposed to severe corrosive influences shall be of corrosion-resistant material suitable for the condition . . ." The fine print note following this section lists several types of locations representative of those which are to be considered severely corrosive, but it does not list any metals, alloys, or protective coatings to indicate what is considered to be corrosion-resistant material.

The Underwriters' Laboratories list rigid ferrous metallic conduit with either an "enameled" coating or with a "metallic corrosion-resistant coating." Section 346-1 prohibits the use of rigid metal conduit and fittings which are protected solely by enamel except in dry indoor locations which are not subject to severe corrosive influences.

Any UL listed rigid metal conduit, then, which has a metallic corrosion-resistant coating may be used ". . . under all atmospheric conditions and occupancies . . ." as permitted by Section 346-1. But under severe corrosive influences, the decision as to what material is suitable rests entirely with the local inspection authority having jurisdiction.

Most inspection authorities accept copper and its alloys, Everdur steel, and galvanized (or Sheridized) steel with an additional plastic coating in such locations. The use of such plastic coated raceways is becoming more widespread, and it is known to have successfully withstood the effects of corrosion in plating and enameling plants with acid bath operations and similar locations.

Aluminum conduit with similar plastic coatings probably would be acceptable also to inspection authorities who have accepted plastic coated steel conduit in such locations.

Commendable improvements have been and are being made in aluminum and its alloys. It is now more easily threaded than it formerly was, fish tapes are somewhat more easily inserted now without gouging than in the first aluminum conduits, and its proneness to oxidation provides it with a degree of inherent protection against some types of corrosion. Its most outstanding advantage, perhaps, is its lightness of weight which greatly facilitates handling and reduces shipping costs.

### Supports in wet locations

Conduit installed in wet locations is required by Section 346-4 to be supported by straps and screws or bolts which are corrosion-resistant or which have corrosion-resistant coatings. The common "black stove bolts" which rust after the first rain have been installed in literally thousands of installations in violation of this section of the Code. However, inspectors are becoming increasingly more strict about such unprotected supports and fastening devices.

The threadless couplings and connectors permitted by Section 346-9(a) to be used with rigid conduit would not be permitted in Class I, Divisions 1 and 2, or in Class II, Division 1, locations. Class II, Division 2, permits the use of EMT and therefore threadless couplings and connectors with rigid conduit would be permitted. Class III, Divisions 1 and 2, require rigid conduit but the term "threaded" is omitted. Hence, some types of threadless couplings and connectors would be permitted. (Such threadless fittings would have to be designed to exclude dust in Class II and flyings in Class III locations.) In Class I, Divisions 1 and 2, and Class II, Division 1, the term threaded is specifically used; and in Class I locations, a minimum of 5 threads is specified.

Section 346-9(b) prohibits the use of running threads for connections at couplings with or without accompanying locknuts. Where necessary, unions or Erickson couplings should be used. (Erickson couplings are not approved for hazardous locations where explosion-proof unions are required.) Running threads are not prohibited by this section at cabinets and cutout boxes.

At times, the contractor finds it convenient to install all conduits before the cabinets are installed, leaving the proper space for later installation of the cabinets. In such cases, the conduits which are to fit in one end of the cabinet are threaded double length so that when the locknuts are run all the way up, the cabinet can be slid over the long threads until it clears the bottom conduits. The locknuts are then brought down into place and tightened. In such cases, the exposed threads should be provided with a protective coating to prevent rust.

### EMT provisions

Electrical metallic tubing as defined by Article 348, and usually referred to as EMT, is similar in many respects to "rigid" conduit, but its use is restricted by the Code to systems with a maximum potential of 600 volts. Its maximum size is restricted to 2-inch trade size, whereas rigid has no Code specified maximum limitation. Rigid is made up to and including 6-inch trade size. The minimum size for both is ½-inch except for restricted uses. (Motor leads not exceeding 6 feet in length may be enclosed in ⅜-inch trade side conduit or tubing, and underplaster extensions may use conduit or tubing not smaller than 5/16-inch inside diameter.) EMT cannot be used in hazardous locations as defined by Article 500 except in Class II, Division 2, areas.

EMT which is protected from corrosion solely by enamel cannot be used at all. (Similarly protected rigid may be used indoors in dry, non-corrosive locations.)

EMT cannot be used where during or after installation it is subject to severe physical damage. As an example of this, if during the pouring of a concrete slab where EMT has been installed prior to the pouring, it becomes necessary to run over the EMT with the wheels of the concrete vehicles, the EMT is very likely to become damaged. If, however—and this question is frequently asked—if the slab can be poured without running over the EMT, or if

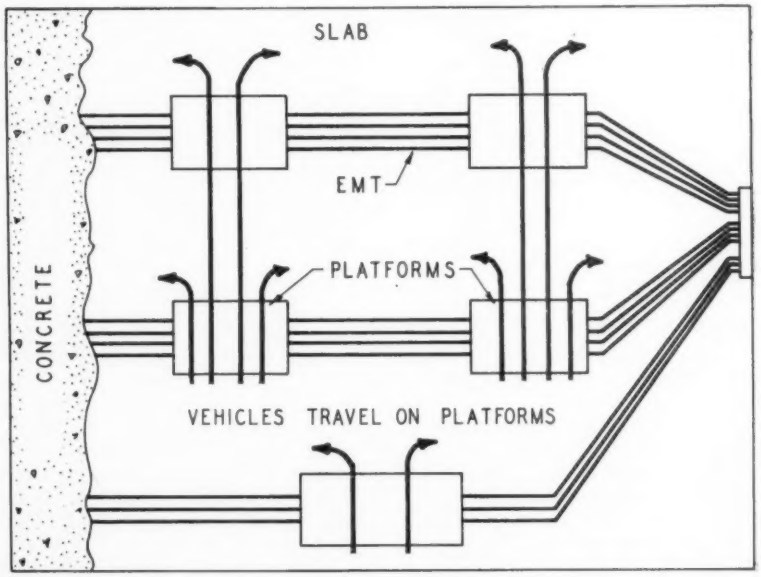


**Fig. 1—The Code permits EMT to be installed in poured slabs, fills and wet locations. In using EMT in slabs, however, it is essential that the tubes be protected from damage that might be caused by wheelbarrows or other concrete vehicles. This can be done by use of protective platforms put over EMT, providing a path for the vehicles over the EMT as shown above. The concrete itself being poured over the EMT will not damage it.**

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properly supported runways are used which hold the vehicles above the tubing, damage is most unlikely.

If the tubing is properly installed and supported with all couplings and connectors of the watertight type and made up as they should be, the actual pouring of the concrete itself on top of the tubing is not likely to damage it. (Like rigid conduit, EMT is not permitted to be installed in cinder concrete or in cinder fills.) See Figure 1.

Unlike rigid conduit, EMT is not threaded. This has an advantage and a disadvantage. The advantage is that the ends of the tubing are not exposed to corrosion because no threading to remove the protective coating is necessary. Ease of handling, of course, is also a distinct advantage which comes from its lightness of weight and also from the absence of threads. The disadvantage is that threadless couplings and connectors are more likely to be left untightened by a careless workman than a threaded joint. (Threadless joints are occasionally used on rigid conduit, too, of course.) Insulated enameled coatings on EMT which would disrupt grounding continuity at threadless couplings and connectors are not permitted; only conductive coatings are approved.

An approved coupling or connector makes a good connection and provides ground continuity when correctly installed and made up. Section 348-8 states, "Threadless couplings and connectors used with tubing shall be made up tight, and where buried in masonry, concrete, or fill, or where installed in wet places, shall be of a type to prevent water from entering the raceway."

Incidentally, this section of the Code is apparently never read by those who contend that EMT is not permitted in concrete slabs or in the earth (fills). The Code does permit such use of EMT. Most inspectors do not accept indenter type couplings and connectors, however, in such areas or in any wet location where the "watertight" feature is required by this section of the Code.

**Answers to Code test questions:** (1. **T** Section 346-1) (2. **T** Section 346-10) (3. **F** Section 346-13-a) (4. **F** Section 346-13-b) (5. **T** Section 348-1) (6. **a** Section 346-1) (7. **b** Section 348-1) (8. **a** Sections 346-4 and 348-4) (9. **c** Section 348-5) (10. **b** Section 348-13-a).

## Questions on the Code

*(Readers are invited to send in questions which they would like to see discussed in this department.)*

### "Floating ground" phrase not a well-defined term

QUESTION: Please explain what is meant by a "floating ground."

ANSWER: This question is asked so frequently that some attempt at an answer must be given from time to time. However, a strictly correct answer is that it means whatever the one using the term wants it to mean. Although it actually has no standard meaning, the term is used in most instances to signify one of two things: (1) A "floating" neutral or (2) an intermittently occurring or a repeated restriking line-to-ground fault.

When the neutral point of a system is left ungrounded, such as in the case of an ungrounded 3-phase, 3-wire, wye-connected system, the neutral point "floats" in a sense. That is, any unbalance in the individual phase loads will result in the neutral point shifting away from the intended neutral point because it is not "tied down" by grounding; and each time such individual loads are altered, the neutral point is again correspondingly shifted. This causes a reduced voltage on the most heavily loaded phase and an increased voltage on the most lightly loaded phase. It is the shifting characteristic of the neutral point which led to the term "floating neutral." This is sometimes erroneously described as a "floating ground."

A line-to-ground fault which causes an arc to strike and restrike is referred to at times also as a "floating ground" because it remains uncleared by the overcurrent protective device. A repeated restrike of such an arc, even in the overcurrent device itself as it operates, is characteristics of ungrounded systems.

In such systems under these conditions, overvoltages are developed which often cause insulation breakdowns in one or more locations on the system other than at, and possibly remote from, the restriking arc. Multiple motor failures sometimes result, also, from this condition.

A grounded system, too, can have an uncleared high resistance fault on a circuit which can ignite combustible material without tripping the circuit if the ground return path has too much impedance. This results from careless installation methods, usually, such as improperly made expansion joints, loose locknuts, incorrect bonding, etc. A grounded system, however, rarely suffers from damage to an extent comparable to that inflicted upon an ungrounded system by restriking arcs.

The best way to get "floating grounds" out of everybody's hair, in my opinion, especially on systems operating on potentials of less than 600 volts, is to follow the requirements *and the recommendations* of Article 250 generally with particular attention directed to Sections 250-5, 250-23, 250-51, 250-54, 250-71, 250-72, 250-81, and 250-112. Attention should be directed also to Section 110-11.

### Overcurrent devices put at outer end of service

QUESTION: Every so often someone mentions the installation of an overcurrent device on the outer end of the service entrance conductors. I have never seen this done. Under what conditions would this be required or permitted by the Code? I understand that when so located it need not be readily accessible. Is this true? How would you pull the switch in an emergency if it is not readily accessible?

ANSWER: In the last part of your question, you are either confusing the overcurrent device with the disconnecting means or else you are assuming that they will be together in the same enclosure under these conditions.

The service disconnecting means is required to be readily accessible by Section 230-70(b) under any and all conditions. It states, "The disconnecting means shall be located at a readily accessible point nearest to the entrance of the conductors, either inside or outside the building wall."

But the readily accessible point which is nearest to the entrance of the conductors may be a considerable distance from this entrance. In other words, the conductors may have to run quite a long distance through portions of the building which are not readily accessible before arriving at the nearest point which is readily accessible.

This nearest readily accessible point is *permissible* for both the disconnecting means and the overcurrent device even when it is not adjacent to the point of entrance. But it is not good practice to run

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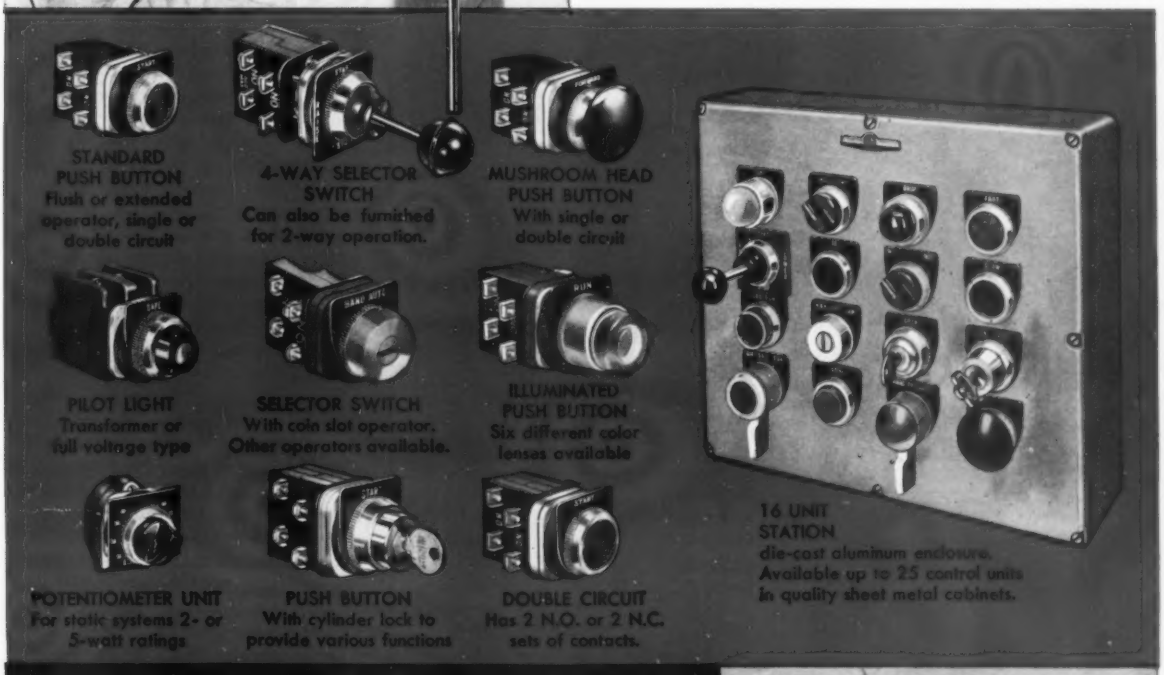

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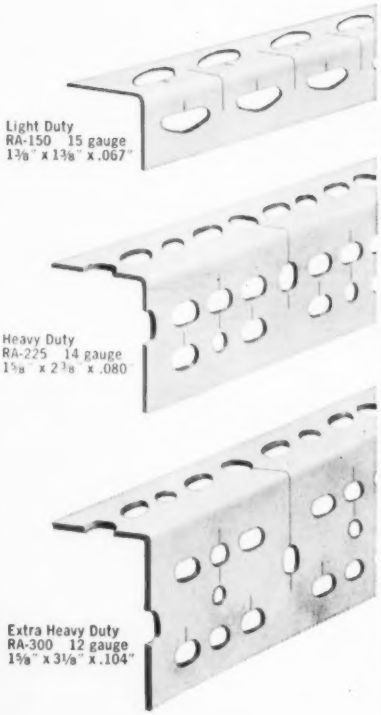


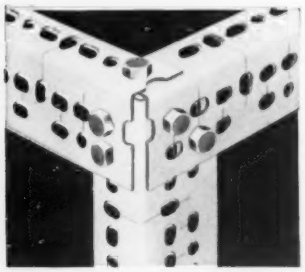

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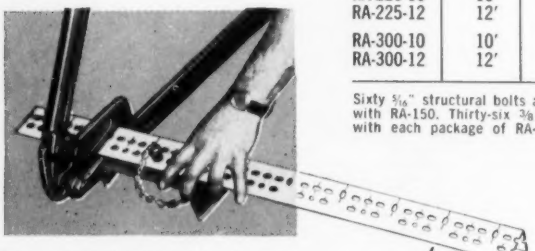

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service conductors which are not protected by overcurrent devices any great distance through a combustible portion of a building. The fine print note following Section 230-44 states, "Service-entrance conductors should not be run within the hollow spaces of frame buildings unless provided with overcurrent protection at their outer end."

This is a recommendation only, but one which is taken seriously by conscientious contractors. Therefore, in order to comply with the requirement that the disconnecting means be readily accessible and also with the recommendation that the conductors not be run through combustible areas of a building without overcurrent protection, it is necessary under occasional circumstances to either revamp a building's layout, locate the overcurrent device on the outer end of the entrance conductors, or locate the entire service equipment on the outside of the building.

In such cases, the service is frequently located outside if the building is not in a congested area. Some owners, however, will not permit the service to be installed outside, and revamping a building can be very simple or it can be very expensive. It is under such conditions that the overcurrent device is sometimes installed at the outer end of the conductors. (Some ordinances *require* the overcurrent device to be installed either immediately upon entering a building or within a minimum specified distance.)

Section 230-91 states, "The service overcurrent device shall be an integral part of the service disconnecting means or shall be located immediately adjacent thereto, unless located at the outer end of the entrance." Section 290-94 indicates that a permissible sequence, if not the preferred one, is to have the overcurrent device ahead of the service switch.

And Section 240-16 states that all overcurrent devices shall be readily accessible with two exceptions. One of the exceptions is for overcurrent devices on busways, and the other is for overcurrent devices on the outer end of service entrance conductors. Therefore, when so located, they need not be readily accessible.

As an example, the overcurrent devices could be installed directly in the outer end of busses on large jobs where such busses enter the building from the vault. Or on a

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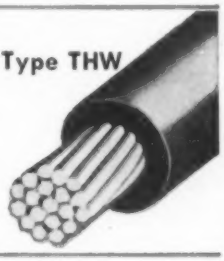

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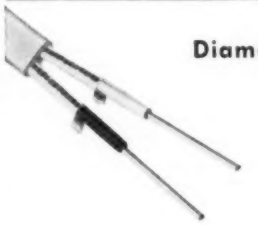

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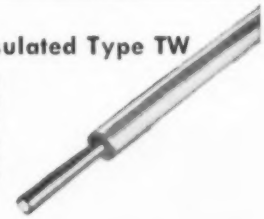

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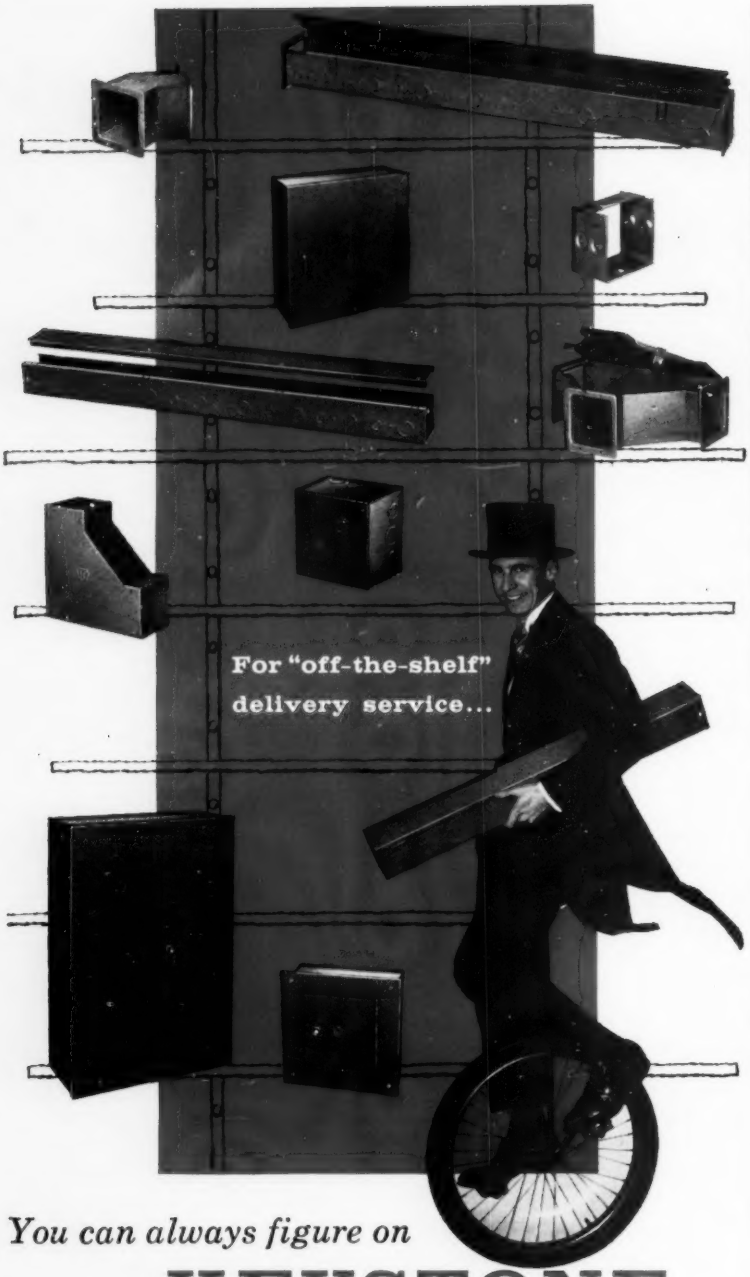


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small installation such as a dwelling, they could be installed in a suitable enclosure either outside or inside the building. Utility companies usually insist upon such enclosures being sealed and located where they can be observed by meter readers to prevent tampering unless they are on the load side of the meter.

Although not required by the Code, where the overcurrent device is located at the outer end of a service entrance conductor, it is the usual practice to install an additional overcurrent device at the service disconnecting means. In other words, the service is treated exactly as it normally would be in any case; and the extra device at the outer end has a higher current rating than the one at the service disconnecting means. Any overloads or faults on such systems would then operate the readily accessible device in the usual way.

The device on the outer end would not be disturbed except in the event of a fault ahead of the disconnecting means. (In most underground network systems, of course, the utility company provides overcurrent protection in the service lateral either before or immediately after entering the building. These are seldom if ever readily accessible.) See Figure 2.

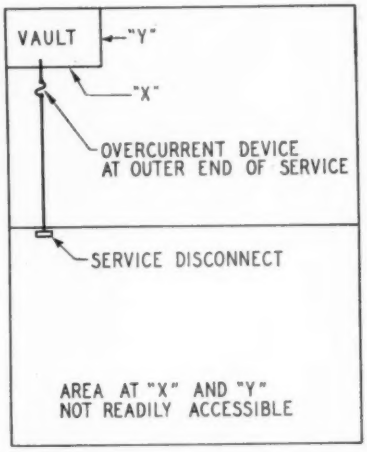
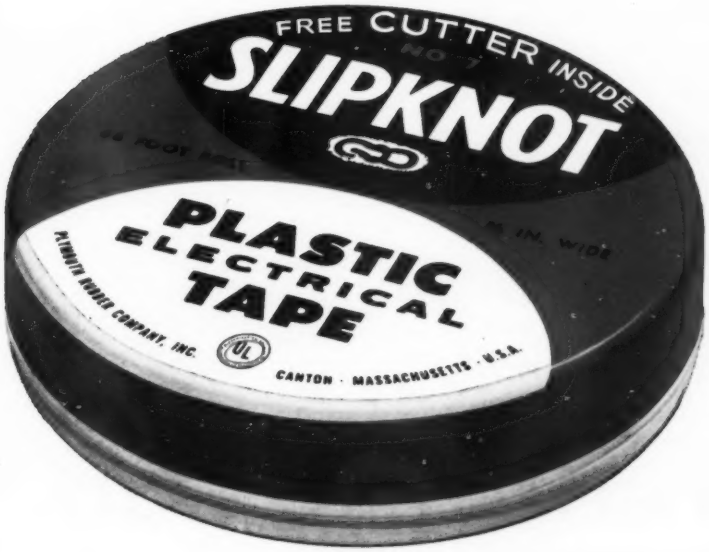



**Fig. 2—To keep service disconnect and overcurrent device at same point, this building could be altered in such a way that the areas marked "X" and "Y" would be accessible and suitable for service disconnect. Otherwise under certain conditions, it may be necessary to install service overcurrent device at point of entrance, as shown, with the service disconnect at a point which is readily accessible.**

# RUGGED YEARS AHEAD . . .

## *that's why the job demands SLIPKNOT*




Whether you're splicing transmission lines or residential outlets, every splice you make must be final, safe and *permanent.* You can't afford any tape but the *best* . . . and the best costs no more. SLIPKNOT PLASTIC ELECTRICAL TAPE is the choice of the country's most experienced electricians, because it *handles easily, conforms readily,* and *snugs* and *stays down.*

With adhesive permanently anchored to vinyl base, with controlled tension for proper stretch without dangerous thinning — with absolute conformity, roll after perfect roll — no wonder SLIPKNOT is the specified tape. The patented cutter, packed free with every 66-foot roll, speeds the job and saves you money.

Find out why SLIPKNOT is found in all the best splices. Try a roll today.

TAPES BY
SOLD ONLY THRU RECOGNIZED DISTRIBUTORS
PLYMOUTH RUBBER COMPANY, INC.

## PLYMOUTH RUBBER COMPANY, INC.

QUALITY SINCE 1896 *Makers of* **SLIPKNOT FRICTION TAPE** — *most widely used in the world* CANTON, MASSACHUSETTS

# It's a Breeze!

## Just a *Double Squeeze*

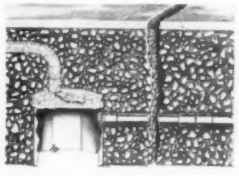
## Sets Up E. M. T.

*With Original B-M Indenter Fittings*

● B-M Indenter Fittings and Tools make an unbeatable combination when it comes to easier E.M.T. installation at less cost. New lightweight plier size indenters make setting up thin wall conduit a breeze. B-M fittings are neater too! No unsightly nuts or projecting set screws. Other plus features of B-M fittings are Concrete tight—Vibration resistant—Extra heavy bright zinc plate, salt spray and acid drip tested for corrosion resistance—Extra heavy positive bonding locknuts—Smooth rounded edges or bushed throat type connectors that prevent insulation damage—All steel construction with extra heavy gauge wall thickness.

B-M Offset Connector, showing how wires are guided over box edge.

Briegel All Steel Indenter Fittings are U.L. approved as Concrete-Tight.



# BRIEGEL METHOD TOOL CO.

## GALVA, ILLINOIS

All B-M indenter type fittings far exceed the requirements of U. L. file card E 10863 and Federal Specifications W-F-406.

TELESCOPE BM SYSTEM

UL

USED THE MOST FROM COAST TO COAST

### Fuses in Class I, Division 2, areas

QUESTION: How is it that circuit breakers and fuses are permitted in Class I, Division 2, locations without being explosion-proof if the number is limited to 10? They are arcing devices, that's for sure! As a reputable contractor, I wouldn't make such an installation. But some of the other shops could do so with complete immunity if they are so minded. Since costs are competitive, this puts me on the spot. I either have to lower my standards or appear out of line costwise to prospective customers. I don't think such installations should be permitted. I would like to see a discussion on this.

ANSWER: There are some inspectors who agree with your contention that this practice should be prohibited. And some of them prohibit such installations in their own respective jurisdictions. Section 501-6(b-4) of the Code, however, does permit the installation of fuses or circuit breakers in general-use enclosures for use as *overcurrent devices only* for *fixed lighting only* in Class I, Division 2, locations provided that not more than 10 sets of fuses or 10 circuit breakers are used in any one area and provided that these devices are *not used for switching purposes.*

A Division 2 location is not normally hazardous. It becomes hazardous only under abnormal conditions, such as might occur as a result of breakage or spillage. And although a *switch* is an arcing device in normal operation, an *overcurrent device* arcs only in the event of a fault interruption.

Therefore, before an overcurrent device could ignite flammable vapors in a Class I, Division 2, location, two things must occur. First, there must be some sort of abnormal condition prevailing which would cause or allow flammable vapors to exist in the area. Second, the wiring to the fixed lighting must develop a fault to cause the overcurrent device to operate.

Furthermore, the vapor must be at the correct mixture with air and in the exact vicinity of the overcurrent device at the precise moment that this device arcs by opening the fault current. Such a combination of circumstances is possible, of course. But most Code making authorities feel that the

*(Continued on page 131)*

TRADE ARRO MARK

MACHINE SCREW ANCHORS

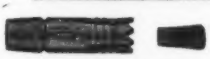
Easy to install . . . requires shallow hole . . . fixture can be removed and replaced without loosening anchor . . . a few hammer blows set anchor firmly . . . conical-shape nut expands lead sleeve to provide strong holding power . . . widely used by electricians, plumbers, carpentes, ornamental iron workers, maintenance men, awning and sign men and other tradesmen.

Cutaway drawings show how setting tool expands lead sleeve around conical nut.

THE TRADE ARRO MARK LINE OF MASONRY ANCHORING AND DRILLING DEVICES

HAMMERLESS SETTING TOOL

Expander hammerless setting tool for easy installation of Arro Machine Screw Anchors in hollow tile, bottomless or weak-bottom holes.



SILVER KING SELF DRILLING SHIELD

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# New series of tables extended to include larger hourly rates

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

CABLE NON-METALLIC SHEATHED
NEW WOOD STORE BLDGS.

| NO. CONDR'S SIZE | HOURS PER "C" | LABOR COST PER FT. INSTALLED AT FOLLOWING RATES | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $2.00 | $2.25 | $2.50 | $2.75 | $3.00 | $3.25 | $3.50 | $3.75 | $4.00 | $4.25 | $4.50 |
| 2/14 | 4.3 | .086 | .097 | .108 | .118 | .129 | .14 | .151 | .161 | .172 | .183 | .194 |
| 3/14 | 4.6 | .092 | .104 | .115 | .127 | .138 | .15 | .161 | .173 | .184 | .196 | .207 |
| 4/14 | 5.0 | .10 | .113 | .125 | .138 | .15 | .163 | .175 | .188 | .20 | .213 | .225 |
| 2/12 | 4.6 | .092 | .104 | .115 | .127 | .138 | .15 | .161 | .173 | .184 | .196 | .207 |
| 3/12 | 5.0 | .10 | .113 | .125 | .138 | .15 | .163 | .175 | .188 | .20 | .213 | .225 |
| 4/12 | 5.3 | .106 | .119 | .133 | .146 | .159 | .172 | .186 | .199 | .212 | .225 | .239 |
| 2/10 | 5.0 | .10 | .113 | .125 | .138 | .15 | .163 | .175 | .188 | .20 | .213 | .225 |
| 3/10 | 5.3 | .106 | .119 | .133 | .146 | .159 | .172 | .186 | .199 | .213 | .225 | .239 |
| 4/10 | 5.8 | .116 | .131 | .145 | .16 | .174 | .189 | .203 | .218 | .232 | .247 | .261 |
| 2/8 | 5.3 | .106 | .119 | .133 | .146 | .159 | .172 | .186 | .199 | .213 | .225 | .239 |
| 3/8 | 5.7 | .114 | .128 | .143 | .157 | .171 | .185 | .20 | .214 | .228 | .242 | .257 |
| 2/6 | 5.7 | .114 | .128 | .143 | .157 | .171 | .185 | .20 | .214 | .228 | .242 | .257 |
| 3/6 | 6.3 | .126 | .142 | .158 | .173 | .189 | .205 | .221 | .236 | .252 | .268 | .284 |
| 2/4 | 6.7 | .134 | .151 | .168 | .184 | .201 | .218 | .235 | .251 | .268 | .285 | .302 |
| 3/4 | 7.3 | .146 | .164 | .183 | .201 | .219 | .237 | .256 | .274 | .292 | .31 | .329 |

E-101-B

LABOR: INCLUDES PREPARATION, DRILLING, CUTTING STRAPPING AND CONNECTING TO BOXES. (NO TAPS OR EXCAVATING.)

4-60



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CABLE NON-METALLIC SHEATHED
NEW (WOOD) OFFICE BLDGS.

| NO. CONDR'S SIZE | HOURS PER "C" | LABOR COST PER FT. INSTALLED AT FOLLOWING RATES | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $2.00 | $2.25 | $2.50 | $2.75 | $3.00 | $3.25 | $3.50 | $3.75 | $4.00 | $4.25 | $4.50 |
| 2/14 | 5.2 | .104 | .117 | .13 | .143 | .156 | .169 | .182 | .195 | .208 | .221 | .234 |
| 3/14 | 5.4 | .108 | .122 | .135 | .149 | .162 | .176 | .189 | .203 | .216 | .23 | .243 |
| 4/14 | 5.8 | .116 | .131 | .145 | .16 | .174 | .189 | .203 | .218 | .232 | .247 | .261 |
| 2/12 | 5.4 | .108 | .122 | .135 | .149 | .162 | .176 | .189 | .203 | .216 | .23 | .243 |
| 3/12 | 5.6 | .112 | .126 | .14 | .154 | .168 | .182 | .196 | .21 | .224 | .238 | .252 |
| 4/12 | 6.3 | .126 | .142 | .158 | .173 | .189 | .205 | .221 | .236 | .252 | .268 | .284 |
| 2/10 | 5.6 | .112 | .126 | .14 | .154 | .168 | .182 | .196 | .21 | .224 | .238 | .252 |
| 3/10 | 6.3 | .126 | .142 | .158 | .173 | .189 | .205 | .221 | .236 | .252 | .268 | .284 |
| 4/10 | 6.5 | .13 | .146 | .163 | .179 | .195 | .211 | .228 | .244 | .26 | .276 | .293 |
| 2/8 | 6.3 | .126 | .142 | .158 | .173 | .189 | .205 | .221 | .236 | .252 | .268 | .284 |
| 3/8 | 6.5 | .13 | .146 | .163 | .179 | .195 | .211 | .228 | .244 | .26 | .276 | .293 |
| 2/6 | 6.5 | .13 | .146 | .163 | .179 | .195 | .211 | .228 | .244 | .26 | .276 | .293 |
| 3/6 | 7.3 | .146 | .164 | .183 | .201 | .219 | .237 | .256 | .274 | .292 | .31 | .329 |
| 2/4 | 7.6 | .152 | .171 | .19 | .209 | .228 | .247 | .266 | .285 | .304 | .323 | .342 |
| 3/4 | 8.3 | .166 | .187 | .208 | .228 | .249 | .27 | .291 | .311 | .332 | .353 | .374 |

E-101-B

LABOR: INCLUDES PREPARATION, DRILLING, CUTTING, STRAPPING AND CONNECTING TO BOXES. (NO TAPS OR EXCAVATING.)

4-60



CABLE NON-METALLIC SHEATHED
FARM BUILDINGS OR GARAGES

| NO. CONDR'S SIZE | HOURS PER "C" | LABOR COST PER FT. INSTALLED AT FOLLOWING RATES | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $2.00 | $2.25 | $2.50 | $2.75 | $3.00 | $3.25 | $3.50 | $3.75 | $4.00 | $4.25 | $4.50 |
| 2/14 | 3.4 | .068 | .077 | .085 | .094 | .102 | .111 | .119 | .128 | .136 | .145 | .153 |
| 3/14 | 3.6 | .072 | .081 | .09 | .099 | .108 | .117 | .126 | .135 | .144 | .153 | .162 |
| 4/14 | 3.8 | .076 | .086 | .095 | .105 | .114 | .124 | .133 | .143 | .152 | .162 | .171 |
| 2/12 | 3.6 | .072 | .081 | .09 | .099 | .108 | .117 | .126 | .135 | .144 | .153 | .162 |
| 3/12 | 3.9 | .078 | .088 | .098 | .107 | .117 | .127 | .137 | .146 | .156 | .166 | .176 |
| 4/12 | 4.2 | .084 | .095 | .105 | .116 | .126 | .137 | .147 | .158 | .168 | .179 | .189 |
| 2/10 | 4.0 | .08 | .09 | .10 | .11 | .12 | .13 | .14 | .15 | .16 | .17 | .18 |
| 3/10 | 4.2 | .084 | .095 | .105 | .116 | .126 | .137 | .147 | .158 | .168 | .179 | .189 |
| 4/10 | 4.5 | .09 | .101 | .113 | .124 | .135 | .146 | .158 | .169 | .18 | .191 | .203 |
| 2/8 | 4.2 | .084 | .095 | .105 | .116 | .126 | .137 | .147 | .158 | .168 | .179 | .189 |
| 3/8 | 4.5 | .09 | .101 | .113 | .124 | .135 | .146 | .158 | .169 | .18 | .191 | .203 |
| 2/6 | 4.5 | .09 | .101 | .113 | .124 | .135 | .146 | .158 | .169 | .18 | .191 | .203 |
| 3/6 | 4.8 | .096 | .108 | .12 | .132 | .144 | .156 | .168 | .18 | .192 | .204 | .216 |
| 2/4 | 5.3 | .106 | .119 | .133 | .146 | .159 | .172 | .186 | .199 | .213 | .225 | .239 |
| 3/4 | 5.7 | .114 | .128 | .143 | .157 | .171 | .185 | .20 | .214 | .228 | .242 | .257 |

E-101-B

LABOR: INCLUDES PREPARATION, DRILLING, CUTTING, STRAPPING AND CONNECTING TO BOXES. (NO TAPS OR EXCAVATING.)

4-60

Electrical Estimating—III

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CABLE NON-METALIC ( BUILDING )
WOOD RESIDENCES (REWORK)

| NO. COND. SIZE | HOURS "C" | LABOR COST INSTALLED PER FT. AT FOLLOWING RATES | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $2.00 | $2.25 | $2.50 | $2.75 | $3.00 | $3.25 | $3.50 | $3.75 | $4.00 | $4.25 | $4.50 |
| 2/14 | 6.0 | .12 | .135 | .15 | .165 | .18 | .195 | .21 | .225 | .24 | .255 | .27 |
| 3/14 | 6.3 | .126 | .142 | .158 | .173 | .189 | .205 | .221 | .236 | .252 | .268 | .284 |
| 4/14 | 6.8 | .136 | .153 | .17 | .187 | .204 | .221 | .238 | .255 | .272 | .289 | .306 |
| 2/12 | 6.1 | .122 | .137 | .153 | .168 | .183 | .198 | .214 | .229 | .244 | .259 | .275 |
| 3/12 | 6.6 | .132 | .149 | .165 | .182 | .198 | .215 | .231 | .248 | .264 | .281 | .297 |
| 4/12 | 7.6 | .152 | .171 | .19 | .209 | .228 | .247 | .266 | .285 | .304 | .323 | .342 |
| 2/10 | 6.3 | .126 | .142 | .158 | .173 | .189 | .205 | .221 | .236 | .252 | .268 | .284 |
| 3/10 | 6.9 | .138 | .155 | .173 | .19 | .207 | .224 | .242 | .259 | .276 | .293 | .311 |
| 4/10 | 7.8 | .156 | .176 | .195 | .215 | .234 | .254 | .273 | .293 | .312 | .332 | .351 |
| 2/8 | 6.8 | .136 | .153 | .17 | .187 | .204 | .221 | .238 | .255 | .272 | .289 | .306 |
| 3/8 | 7.6 | .152 | .171 | .19 | .209 | .228 | .247 | .266 | .285 | .304 | .323 | .342 |
| 2/6 | 6.5 | .13 | .146 | .163 | .179 | .195 | .211 | .228 | .244 | .26 | .276 | .293 |
| 3/6 | 9.1 | .182 | .205 | .228 | .25 | .273 | .296 | .319 | .341 | .364 | .387 | .41 |

E-102-B

LABOR: INCLUDES DRILLING, CUTTING, INSTALLATION, STRAPPING AND CONNECTING TO BOXES (NO TAPS) - ADD FOR OPENING UP JOB.

4-60

Electrical Estimating—III

CABLE NON-METALIC SHEATHED (BLDG)
NEW WAREHOUSES WOOD

| No.Condr's SIZE | Hours "C" | LABOR COST INSTALLED PER FT. AT FOLLOWING RATES | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $2.00 | $2.25 | $2.50 | $2.75 | $3.00 | $3.25 | $3.50 | $3.75 | $4.00 | $4.25 | $4.50 |
| 2/14 | 3.6 | .072 | .081 | .09 | .099 | .108 | .117 | .126 | .135 | .144 | .153 | .162 |
| 3/14 | 3.8 | .076 | .086 | .095 | .105 | .114 | .124 | .133 | .143 | .152 | .162 | .171 |
| 4/14 | 4.2 | .084 | .095 | .105 | .116 | .126 | .137 | .147 | .158 | .168 | .179 | .189 |
| 2/12 | 3.7 | .074 | .083 | .093 | .102 | .111 | .12 | .13 | .139 | .148 | .157 | .167 |
| 3/12 | 4.1 | .082 | .092 | .103 | .113 | .123 | .133 | .144 | .154 | .164 | .174 | .185 |
| 4/12 | 4.5 | .09 | .101 | .113 | .124 | .135 | .146 | .158 | .169 | .18 | .191 | .203 |
| 2/10 | 3.8 | .076 | .086 | .095 | .105 | .114 | .124 | .133 | .143 | .152 | .162 | .171 |
| 3/10 | 4.4 | .088 | .099 | .11 | .121 | .132 | .143 | .154 | .165 | .176 | .187 | .198 |
| 4/10 | 4.5 | .09 | .101 | .113 | .124 | .135 | .146 | .158 | .169 | .18 | .191 | .203 |
| 2/8 | 4.2 | .084 | .095 | .105 | .116 | .126 | .137 | .147 | .158 | .168 | .179 | .189 |
| 3/8 | 4.9 | .098 | .11 | .123 | .135 | .147 | .159 | .172 | .184 | .196 | .208 | .221 |
| 2/6 | 5.0 | .10 | .113 | .125 | .138 | .15 | .163 | .175 | .188 | .20 | .213 | .225 |
| 3/6 | 5.4 | .108 | .122 | .135 | .149 | .162 | .176 | .139 | .203 | .216 | .23 | .243 |
| 2/4 | 5.3 | .106 | .119 | .133 | .146 | .159 | .172 | .186 | .199 | .212 | .225 | .239 |
| 3/4 | 6.3 | .126 | .142 | .158 | .173 | .189 | .205 | .221 | .236 | .252 | .268 | .284 |

E-101-B

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4-60

Electrical Estimating—III

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Over 45,000 ft. of Spang Steel Conduit will provide top-quality wiring protection in this new apartment building.

# STEEL CONDUIT DOES A BETTER JOB FOR YOU

## (*especially when it's SPANG®!*)

### WHEN YOU BUY STEEL CONDUIT . . .

. . . you're buying conduit with the inherent strength of steel. It resists damage from rough handling at the job site, and has great structural strength when installed.

Steel conduit has high corrosion and chemical resistance, is not affected when buried in concrete or slag. It has excellent electrical characteristics, good conductivity and high resistance to arcing and short circuiting of its conductors.

Steel conduit is adaptable to every type building construction, and provides long and satisfactory service life.

### WHEN YOU BUY SPANG STEEL CONDUIT . . .

. . . you're buying steel conduit that's uniform throughout, thanks to careful quality control. It's easy to bend, cut and thread, helping save construction time.

The superior Spang hot-dipped galvanized finish resists chipping, flaking and peeling even on the severest bends. The extra coating of clear lacquer provides even greater surface protection. The smooth interior finish promotes easy wire pulling.

Spang Steel Conduit is known by electrical contractors everywhere as a top-quality product that assures a good job every time!

### MAKE SPANG YOUR FIRST CHOICE—ALWAYS!

Your local Spang Distributor will give you top-quality service on your Spang order. Next job: Make it Steel Conduit . . . Make it Spang!

SPANG CONDUIT

**THE NATIONAL SUPPLY COMPANY**

Two Gateway Center, Pittsburgh 22, Pennsylvania

Subsidiary of Armco Steel Corporation

# News of the industry

*edited for Southern readers*

## NAED sets convention in Dallas April 30

THE 52ND ANNUAL convention of the National Association of Electrical Distributors will be held in the Memorial Auditorium of Dallas, Texas on April 30 through May 4.

Committee meetings will occupy the Saturday session on April 30, including meetings of the Lamp Committee, Low Voltage Distribution Apparatus Committee, Special Committee to Study Association's Constitution and By-laws, Executive Committee, Wire and Cable and Armored Conductor Committee, and the Motors and Industrial Controls Committee.

Activity on Sunday will include only a board of director's meeting and luncheon, although the Conference Booth Center will be open from 2 to 5 in the afternoon.

The first formal conference session will be held on Monday, with J. A. Meier, vice-president of the NAED Southern Region, presiding. Highlights of the day will include addresses by Frederick J. Close, vice-president of the Aluminum Company of America; N. J. MacDonald, president of the National Electrical Manufacturers Association; and George W. Provost, Jr., president of NAED.

B. H. Boatner, vice-president, NAED Eastern Region, will preside over Tuesday's sessions. Main talks that day will be given by Harold A. Webster, president of the National Electrical Contractors Association; Maurice L. Lipsich, vice-president and director of sales for Dormeyer Corporation; and Walter P. Cronkite, news analyst and commentator for the Columbia Broadcasting System.

The final business of the conference will be concluded on Wednesday, with C. E. Butler, vice-president of the NAED Central Region, presiding. Committee reports by J. M. Newton, Sr., chairman of the NAED Finance Committee, and Arthur W. Hooper, NAED executive director, will be given at this time. A special presentation, "Let's Swap Marketing Ideas," will also be held during that meeting.

The Conference Booth Center will be open every afternoon for several hours, and as an additional attraction, a rodeo for delegates will be held Tuesday evening in Fair Park, Dallas.

## Woman's college founds first wiring laboratory

THE WOMAN'S College School of Home Economics, Greensboro, N. C., has established a Home Lighting and Wiring Laboratory. This is the first school of its type in the nation known to have established such a laboratory.

The idea was originated by Dr. Naomi G. Albanese, Dean of Woman's College. Realizing that lighting and wiring are today a vital part of homemaking, she felt that home economics students should have the opportunity to become thoroughly familiar with them.

The laboratory has been made possible by the efforts and contributions of the Virginia Electric and Power Co., Carolina Power and Light Co., and Duke Power Co. The laboratory will be used not only by students, but will be made available to home builders, home planners, and for conferences, seminars, and workshops for extension agents, architects, engineers, decorators, and others interested in lighting or wiring.

**Duke Power executives meet with Greensboro's Woman's College officials to aid establishment of a home lighting and wiring laboratory in the School of Home Economics. Left to right, Miss Madeline B. Street, chairman of Home Management Section; Roy A. Palmer, Illuminating Engineer, Charlotte; Dr. Naomi G. Albanese, dean; W. J. Burton, district manager, and James A. Lowe, lighting engineer, both of Greensboro.**

## AIEE sets conference on textile industry

THE TEXTILE Industry Subcommittee of the American Institute of Electrical Engineers will hold its annual conference on "Electrical Application in the Textile Industry" at the Heart of Atlanta Motel in Atlanta, Ga., on May 5 and 6, 1960.

The conference is designed to bring together managers, engineers, technicians, and master mechanics of the textile industry to discuss mutual points of interest concerning electrical equipment.

## Appalachian elects Hodges vice-president

RICHARD E. HODGES, assistant general manager, has been elected vice-president and general manager by the Appalachian Electric Power Company board of directors, Philip Sporn, Appalachian president has announced. Mr. Hodges replaces G. L. Furr, who is retiring as general manager.

Mr. Hodges has been associated with Appalachian and Kentucky Power Company since 1926, following his graduation from West Virginia University. In 1940, he became assistant general manager of Kentucky Power, and general manager in 1943. Five years later, he was appointed manager of Appalachian's Charleston Div., and in 1954, moved to Roanoke as assistant general manager.

## Electric heating fair draws Arkansas public

AN ELECTRIC Heating Fair, thought to be the first of its kind in Arkansas, was recently held in Little Rock.

Focal point of the fair was a display of electric heating equipment on exhibit in the lobby of Arkansas Power & Light Company's Little Rock office building.

The fair display, which included heat pumps, portable and built-in resistance heating equipment, and insulation exhibits, was open to the public during the entire months of February and March. The fair was held in cooperation with manufacturers and distributors of electrical heating equipment.

According to W. M. Shepherd, vice-president of the Arkansas company, the display was the most complete assemblage of electric heating ever gathered under one roof in Arkansas. "Constant inquiries about electric heating from people throughout the state prompted us to get together with manufacturers and distributors to stage an educational fair of this type," he stated.

Mr. Shepherd noted that interest in electric heating is evidenced by the fact that the number of electric heating installations on Arkansas Power & Light Company's lines were doubled last year over 1958.

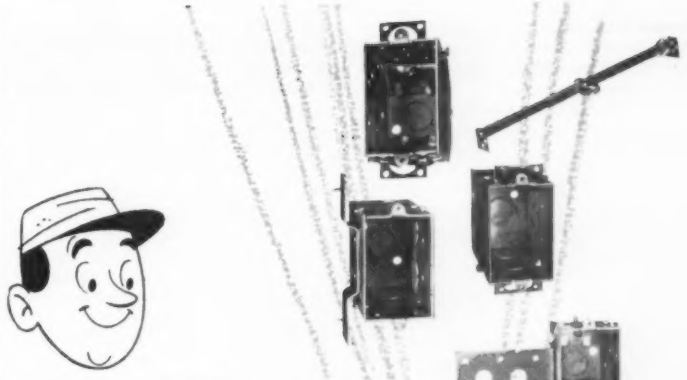
## Home magazine sponsors contractor contest

A NEW CONTEST for electrical and heating contractors offers more than $1,500 worth of prizes for the case histories of their best sale of electric heating and/or year-round air conditioning.

The *Better Homes & Gardens* Electric Heating and Year-round Air Conditioning Contest is designed to collect the best selling techniques in the field for the benefit of the entire industry. Findings will be shared with the electrical and heating contracting industry after winners are announced this summer.

*Better Homes & Gardens* supplies entry forms at no cost or fee from Retail Merchandise Mgr., Meredith Publishing Co., Des Moines 3, Iowa. Entrants simply answer the questions on the form. To be fair, the contest is divided into two categories: installations in new homes and installations in remodeled homes. Both categories are of equal importance and prizes for each are equal.

Winners choose their prizes from the products advertised in *Better Homes & Gardens*. First prize is $750 worth of advertised merchandise. Second prize is $500 worth; third prize, $100 worth; and fourth prize, $75 worth. Fifty additional prizes are a choice of any *Better Homes & Gardens* Idea Books.

SPARKY SAYS:

"I WORK FASTER AND SAVE TIME WITH WIEGMANN BOXES,"

BECAUSE:

There's a RIGHT STYLE AND TYPE for every wiring need, and they're TOP QUALITY TOO!

There's a generation of skill and experience in every WIEGMANN PRODUCT.

All are made of full gauge steel to meet code requirements.

Switch boxes have the finest electroplated finish in the industry.

For appearance, efficiency and utility, there's none better.

Believe me — a chap can do the job better, faster and easier with WIEGMANN wiring supplies.

Order through your electrical wholesaler.

E. M. WIEGMANN & COMPANY, INC. FREEBURG, ILLINOIS

(located in metropolitan St. Louis means fast delivery everywhere)

The electric heating and/or year-round air conditioning job described by the contest entrant must be completed between January 1, 1960 and June 30, 1960. Entries are to be postmarked not later than midnight July 15, 1960.

## Orlick-Kolmaister opens new service warehouse

THE OPENING of a new 10,000 square foot warehouse by Orlick-Kolmaister, electrical manufacturer's representative, has recently been announced by the firm. From the new warehouse, shipments of American Insulated Wire can be sent direct to Louisiana, Mississippi, Alabama, and Texas markets.

The warehouse includes a front shipping and receiving dock, with railroad tracks in the rear of the building. Modern offices are also housed in the building.

The company's business in North Carolina, South Carolina, Florida, and Tennessee will continue to receive service from the Pawtucket, R. I., factory of American Insulated Wire Corp.

## Arkansas NECA holds annual convention

ELECTION of officers was one of the important points of business of the Arkansas Chapter of the National Electrical Contractors Association, when the organization's Eleventh Annual Convention was held recently in Little Rock.

New officers elected were Ellis M. Fagan, III, of Fagan Electric Co., Inc., Little Rock, president; H. L. Hamilton, of Texarkana Electric Co., Inc., Texarkana, vice-president; and Ollie Rains, of Rains Electric Co., Hot Springs, treasurer. Jack Ketzscher, of North Little Rock Electric Co., was re-elected as the chapter representative on NECA's National Board of Governors.

Additional directors elected were Joe Ellen, of Ellen Brothers Electric Co., El Dorado; Walter Stewart, of Stewart Electric Service, Jonesboro; Wm. F. Byrd, of Harvill-Byrd Electric Co., Little Rock; Russell Clark, of C. & C. Electric Construction Co., Little Rock; and A. S. Henderson, of Texas Electric Company, Texarkana. Delton Houston, the retiring president, was elected director-at-large.

The chapter also passed resolutions dealing with recommended changes in the state sales tax laws and with NECA's standing policy statements regarding the functions of the electrical contractor.

On the first evening of the convention, the distributors, in cooperation with fifty manufacturers, were hosts to about 400 guests, representing NECA and other allied groups at a hospitality party which included dinner and dancing.

The convention closed during the evening of the next day, with the annual banquet. Guest speaker for this occasion was Winthrop Rockefeller, who spoke on the "Industrial Development of Arkansas." Mr. Rockefeller emphasized the importance of communicating in a warm and sincere manner to industrial leaders everywhere that industry was really wanted by Arkansas and its citizens, and would always be welcomed here. He was introduced by Senator Ellis M. Fagan, who also presented the chapter's coveted Award of Merit to Ollie Rains, of Hot Springs, for outstanding leadership and noteworthy service to the electrical industry.

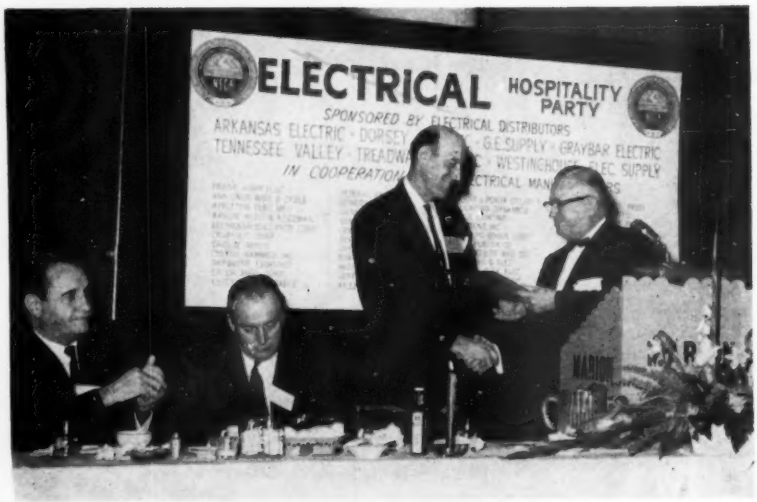
Among other special guests were Governor Orval E. Faubus, Attorney General Bruce Bennett, and George A. Seaman, Sr., NECA's Southern Region director, of Fort Worth.

Jack Ketzscher, the chapter governor, was the master of ceremonies at the annual banquet.

## Day-Brite names Owen new marketing manager

THE APPOINTMENT of Russell E. Owen as manager of marketing service for Day-Brite Lighting, Inc.

**Newly elected officers for the Arkansas NECA Chapter include, clockwise from left, Ellis M. Fagan, III, president; Jack Ketzscher, chapter governor; Ollie Rains, treasurer; and H. L. Hamilton, vice-president.**




**Ollie Rains, standing at left, receives Arkansas Chapter's "Award of Merit" from Senator Ellis M. Fagan, with Governor Orval E. Faubus, far left, and Winthrop Rockefeller attending the ceremony.**

**Russell E. Owen**

has been announced by Gordon Wells, general manager, Marketing Div. He will be responsible for marketing activities including advertising, sales promotion, and public relations.

Formerly sales manager, Curtis Lighting Div., Curtis All-Brite Lighting, Inc., Mr. Owen has been associated with the lighting industry for six years. He joined Curtis as advertising and sales promotion manager, and prior to that he was merchandising manager of the Miller Company, in Meriden, Conn.

Owen majored in marketing and sales at the University of Connecticut and attended special courses in marketing and finance at the Wharton School of Business, University of Pennsylvania. He was a charter member of the Sales Promotion Managers Association of New York and is an associate member of the Illuminating Engineering Society.

## New product managers for National Electric

TWO NEW PRODUCT managers have been appointed by National Electric Div., H. K. Porter Co., Inc., it was announced by William Hallam, divisional sales manager.

Ray Schuler has been named product manager, underfloor raceways, and will supervise the sales and service of underfloor electrical distribution equipment used in the large construction market.

Irvin C. Turner has been appointed product manager, surface raceways, and will be responsible for the sales and service activities of electrical distribution products marketed in the residential and commercial construction industry.

Mr. Schuler joined the company in 1954 as a sales representative in the Cincinnati branch and later was promoted to a field sales engineer in the Pittsburgh district.

Mr. Turner began in Atlanta, Ga., as a sales specialist for engineered products in the southeastern district. He then served as branch manager of the Kansas City branch for two years prior to his new assignment.


# Save up to 70%
## of wire-pulling costs

. . . with the safe, speedy **JET LINE METHOD***

Hundreds of contractors are saving HOURS in wire-pulling time, using the Jet Line Method! A Jet Line Cylinder or Jet Line Gun puts a line through a conduit faster than a man can uncap pipe . . . saves up to $40 per day or 70% of wire-pulling costs!

No fish tape, no snaking . . . simply jet-propel a nylon line through the conduit with the Cylinder or Gun. Pull Jet Line Poly Rope through, then wire . . . the job is completed in minutes instead of hours! The Method works regardless of ells, bends, ups, or loose obstructions. Safe too, because Jet Line uses no explosives, and both the nylon line and the poly rope are non-conductors.

Use the Jet Line Cylinder for ½", ¾", and 1" conduit; use the Jet Line Gun for conduit 1" and larger. In any case, the Jet Line Method does the job better, quicker, safer, and for less cost!

### OWN THE COMPLETE JET LINE METHOD

**Jet Line Cylinder**—for ½", ¾" and 1" conduit. Propels a nylon line "package" through the conduit by means of pressure-expansion of safe, non-explosive Jet Line Gas. New Portable Refill Unit recharges Cylinder at the job!

**Jet Line Gun**—for conduit 1" and larger. Launches a self-propelled cartridge which travels the length of the conduit, pulling nylon line through behind it. No powder, no explosion—safe!

**Jet Line Poly Rope**—attach one end to the nylon line, the other end to wire. Pull the line, pull the rope, and you pull wire! Non-conductor, slides easily, cannot damage conduit.

**Forget fish tape forever . . . save time, money, and wire with the Jet Line Method.**

*Pat. #2,930,584

*Ask your distributor for details, or write*

A703

**JET LINE PRODUCTS INC.**

615 FUGATE AVENUE, CHARLOTTE 5, NORTH CAROLINA

## Ga. Tech conference on protective relaying

THE 1960 Protective Relaying Conference sponsored by the School of Electrical Engineering and the Engineering Experiment Station of the Georgia Institute of Technology has been set for May 5-6.

The conference will be held in Georgia Tech's School of Architecture Auditorium, and will include discussions on the evaluation of high speed relay methods, relaying power plant auxiliary switchgears, back-up relay protection, micro-wave channels, and high speed transmission line relaying. Also on the agenda are talks on sensitive ground protection, automatic oscillograph application and uses, the lotran system, and problems of superimposing 230 kv on an existing system. In addition, gas pressure relays, relay protection of 25 kv, 4-wire distribution systems, and use of static devices in power plant protection will be covered.

Dr. H. P. Peters is serving as head of this year's program committee.

## Dates ahead

**Missouri Valley Electric Association,** Engineering Conference, President Hotel and Municipal Auditorium, Kansas City. Mo., Apr. 20-22, 1960.

**Illuminating Engineering Society,** South Central—Southeastern Regional Conference, Hotel Peabody, Memphis, Tenn., April 21-22, 1960.

**Illuminating Engineering Society,** Southwestern Regional Conference, Robert Driscoll Hotel, Corpus Christi, Texas, April 25-26, 1960.

**IAEI, Alabama Chapter,** Admiral Semmes Hotel, Mobile, Ala., April 25-26, 1960.

**National Association of Electrical Distributors,** Annual Convention, Adolphus Hotel, May 1-4, 1960.

**IAEI, Tennessee Chapter,** Andrew Jackson Hotel, Nashville, Tenn., May 2-3, 1960.

**American Institute of Electrical Engineers,** Textile Industry Subcommittee, Heart of Atlanta Motel, Atlanta, Ga., May 5-6, 1960.

**Protective Relaying Conference,** Georgia Institute of Technology, Atlanta, Ga., May 5-6, 1960.

**Southeastern Electric Exchange,** Heat Pump Task Force Committee Meeting, King Edward Hotel, Beaumont, Texas, May 5-6, 1960.

**IAEI, Florida Chapter,** George Washington Hotel, West Palm Beach, Fla., May 5-7, 1960.

**IAEI, Texas-Louisiana Joint Meeting,** Five Chapters, Hotel Marshall, Marshall, Texas, May 6-7, 1960.

**IAEI, Georgia-South Carolina Chapters,** Joint Meeting, De-Soto Hotel, Savannah, Ga., May 9-10, 1960.

**Southeastern Electric Exchange,** Industrial Sales Power Conference, Battery Park Hotel, Asheville, N. C., June 2-3, 1960.

**National Rural Electric Cooperative Assn.,** Region I, Annual Meeting, Commander Hotel, Ocean City, Md., Sept. 8-9, 1960.

**Illuminating Engineering Society,** National Technical Conference, Penn-Sheraton Hotel, Pittsburgh, Pa., Sept. 11-16 1960.

**National Rural Electric Cooperative Assn.,** Region VIII, Annual Meeting, Hotel Arlington, Hot Springs, Ark., Sept. 12-13, 1960.

**National Rural Electric Cooperative Assn.,** Region II, Annual Meeting, Kentucky Hotel, Louisville, Ky., Sept. 15-16, 1960.

**Southeastern Electric Exchange,** Accounting Conference, Tides Hotel, St. Petersburg, Fla., Sept., 29-30, 1960.

**American Institute of Electrical Engineers,** Fall General Meeting, Chicago, Ill., Oct. 9-14, 1960.

**National Rural Electric Cooperative Assn.,** Region II, Annual Meeting, Henry Grady Hotel, Atlanta, Ga., Oct. 10-11, 1960.

**National Rural Electric Cooperative Assn.,** Region IV, Annual Meeting, Stonewall Jackson Hotel, Clarksburg, W. Va., Oct. 13-14, 1960.

**National Rural Electric Cooperative Assn.,** Region X, Annual Meeting, Baker Hotel, Dallas, Texas, Oct. 17-18, 1960.

**IAEI, Southern Section,** Rice Hotel, Houston, Texas, Oct. 17-19, 1960.

**Southeastern Electric Exchange,** Engineering and Operation Section Conference, Shoreham Hotel, Washington, D. C., Oct. 20-21, 1960.

**Southeastern Electric Exchange,** Sales Conference, Henry Grady Hotel, Atlanta, Ga., Nov. 16-18, 1960.

## Potomac Edison calls reserve heads to duty

HARRY H. STARTZMAN, vice-president, engineering and operating for the Potomac Edison Co., has been designated chief executive officer of the company and its subsidiaries, due to the recent illness of D. E. Stultz, president.

The plan was called into active use because the illness of Mr. Stultz is expected to require a prolonged convalescence period away from his office. The move follows the already established chief executive officer emergency succession provisions of the company's emergency management plan, which give Mr. Startzman the duties of the president in the latter's absence.

Mr. Startzman was elected vice-president in 1954, and serves as a member of the board of directors and as a member of the executive committee of the board.

## Electric company gets safety recognition

H. H. SHATTUCK, manager of Coast Electric Power Assoc., Bay St. Louis, will be featured in leading national magazine ads in the near future.

In his own words, Mr. Shattuck tells the story of the crews of men who "Keep the lights burning" and of the outstanding safety record enjoyed by Coast Electric Power Assoc.

"As safety engineers will tell you," says Mr. Shattuck, "the interest our crews take in their work is a part of what keeps men from having accidents on the job. Safety is a matter of attitude as well as awareness—training, too, and teamwork." Coast Electric Power Association has chalked up over 500,000 man-hours, more than five years, without a lost-time accident. This record is significant when it is realized that "hot line" crews work with 12,000 volts circuits, and maintain service 24 hours a day in all kinds of weather.

The Coast Electric Power Association serves over 8,000 members and operates 1,825 miles of power lines in the tri-county area. Coast Electric vehicles have been driven over 2½ million miles during the past 10 years with less than a $1,000 loss incurred. All vehicles are fully equipped with fire extinguishers,

first aid kits, flares, and other safety devices, and on several occasions have aided others involved in traffic mishaps.

Recently Mr. Shattuck received a gold plaque safety trophy awarded by a leading insurance company.

Mr. Shattuck and Coast Electric Power Association are being currently featured in a full page advertisement of Employers Mutuals of Wausau under the title, "Wausau Story." The advertisement will be used in issues of *U. S. News and World Report, Time Magazine, Saturday Evening Post, Business Week,* and *Newsweek.*

## Marsh leaves Ansonia to form own sales firm

JOHN L. MARSH, former vice-president of the Ansonia Wire & Cable Co., has resigned to form his own sales company, Jack Wilder, president of the Ansonia company an-

**John L. Marsh**

nounced recently. Mr. Marsh will represent Ansonia in Florida, Alabama, and Georgia.

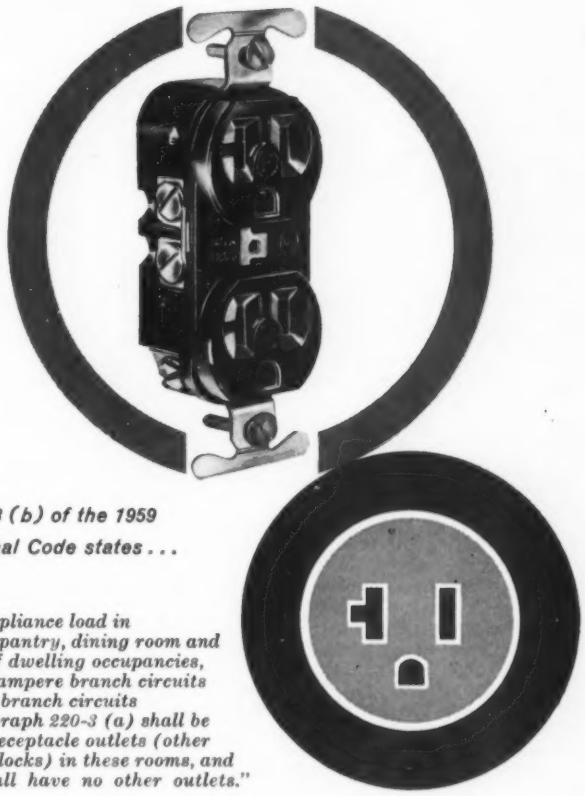
The new company, John L. Marsh & Associates, will keep temporary offices in the Barnett National Bank, Jacksonville, Fla. Names of Mr. Marsh's associates and other manufacturers whom the firm will represent will be announced later.

## Contract let on giant Texas shopping center

CRAIN Electric Co., Amarillo, Texas, has begun the electrical work on the multi-million dollar Sunset Center—which will house some 40 competitive shops under a single roof.

Sam Crain, the electrical contractor, has a negotiated sub contract with the Inwood Construction Co., of Dallas, which is building the huge center. Mr. Crain did not disclose the amount of the contract. The contract calls for completion of the Center by September, 1960.


**NEW CIRCLE F 20-AMP "U"-GROUND DEVICES**



*. . . Section 220-3 (b) of the 1959 National Electrical Code states . . .*

*"For the small appliance load in kitchen, laundry, pantry, dining room and breakfast room of dwelling occupancies, (1) 2 or more 20-ampere branch circuits in addition to the branch circuits specified in paragraph 220-3 (a) shall be provided for all receptacle outlets (other than outlets for clocks) in these rooms, and such circuits shall have no other outlets."*

*Designed to provide full compliance* with the revised Code, Circle F's *new* No. 2532 does much more! It becomes a "universal" outlet! It accommodates appliances, heavy-duty portable tools, business machines, etc., having substantial energy requirements, where the new 20 A.-125 V. plug cap (No. 2528) is necessary. It also accommodates 15 A.-125 V. 3 wire U-ground and standard parallel blade caps. One outlet for all! Circle F's quality is tops and the price is right. Contact your Circle F representative for complete details.

**CIRCLE F MFG. CO.**

**TRENTON 4, NEW JERSEY**

The initial construction will cover 300,000 square feet—or seven acres. Future plans call for an additional 200,000 square feet of floor space. The building will be one-floor construction, with the exception of the portion occupied by the two-floor J. C. Penney store.

A Denver, Colo., architect and engineer, Gerri Von Frellick, is associated with the Sunset Center Corp., of Amarillo, and Industrial Unranium Co., of Salt Lake City, in the Sunset Center project. M. T. Johnson, Jr., is president of Sunset Corp.

Sunset Center will be the third large department store shopping facility designed by Von Frellick.

Crain Electric will design and install all of the electric work in the Center.

## Westinghouse heating names four to sales

APPOINTMENT of three Southern and Southwestern sales engineers and their assignments to new sales regions for electric heating products have been announced by Westinghouse Electric Corporation's air conditioning division. Stuart L. Forsyth, sales manager of electric heating products for the division, explained that the three new regions, together with three others already in existence and two new ones in the North, will serve the entire United States.

Those receiving the new assignments in the South and Southwest include E. W. L. Seager, with headquarters in Staunton, Va., Arthur F. Holland, in St. Louis, Mo., and Foster Massey, in Atlanta, Ga.

Another sales representative who is included in the division's expanded sales effort in electric heating products is C. B. Ross, in Chattanooga, Tenn.

Mr. Seager entered joined Westinghouse in 1953, after graduating from Syracuse University.

Mr. Holland studied at Washington University and the University of Illinois. Prior to joining Westinghouse, he was with the Mall Tool Co.

Associated with the company since 1952, Mr. Massey is a graduate of the Industrial Training Institute of Chicago.

Mr. Ross became a sales engineer with Westinghouse in 1958, after completing the company's training course the year before.

## Giesse to manage Virden sales promotion

WILLIAM C. GIESSE has been appointed sales promotion manager of the John C. Virden Co., Cleveland, Ohio. R. W. Minett, Jr., vice-president marketing, made the announcement.

Mr. Giesse's area of responsibility will be in the planning and execution of sales promotion and advertising programs in cooperation with the divisional sales and advertising managers. In addition, he will be a part of the over-all activities of the Central Management Marketing Dept.

Giesse has spent the past twelve years in sales and advertising work. His most recent position was as account executive with Carr Liggett Advertising, Cleveland, Ohio. He is a graduate of Kent State University.

**NEW ELECTRIC HOME EQUIPMENT—Frank Cody and Bill Murray, representatives of Progress Mfg. Co., introduce their new power vent hood and fan lines to personnel of the Cain Lighting and Supply Co., at the Atlanta, Ga., Electric League's "Reddy Kilowatt Room."**

## Brief news notes of manufacturers

ONE OF THE LARGEST and most modern plants in the country devoted exclusively to the production of all types of natural and synthetic rubber insulated wire and cable for the electrical industries is scheduled for completion early in 1960, at Linden, N. J. The plant is being built for Hatfield Wire & Cable Division of Continental Copper and Steel Industries, Inc., 120 Broadway, New York, N. Y. Frank Grad & Sons of Newark, N. J., architects and engineers, designed the new structure.

* * *

THE APPOINTMENT of Herbert Wile, Jr. as advertising manager for Metalcraft Products Co., Inc. of Philadelphia, Pa., has been announced by Nathan Bloom, president of the firm.

In his new position, Mr. Wile will be responsible for all media, direct mail, and promotional advertising for both Metco Lighting and General Metalcraft Co., Inc.

He was formally an account executive and service manager for the David Zibman Advertising Agency.

* * *

FEDERAL PACIFIC Electric Co., of Newark, N. J., has recently acquired

**Modern new plant under construction for Hatfield Wire and Cable Div.**

the outstanding stock of Cornell-Dubilier Electric Corp., thus gaining control of the company.

The Cornell-Dubilier company will be operated by Federal Pacific as a consolidated subsidiary. The stock exchange is expected to bring about closer alignment of the two companies, and to strengthen the position of each company in its own field of activity.

* * *

ALLIS-CHALMERS announced recently that in order to provide greater coordinated service to its industrial customers, it had combined its Industrial and General Products Divisions into a new operating unit called the Industrial Equipment Div., with W. M. Wallace, a vice-president and general manager of the new division. G. A. Saar was appointed assistant general manager.

The new division includes the Compressor, Processing Machinery, Centrifugal Pump, Control, and the Industrial Systems departments, plus the Norwood Works, motor and pump manufacturing facility.

* * *

G & W ELECTRIC Specialty Co., Blue Island, Ill., has recently made two new appointments.

Norman O. Kirkby has been made general manager. He came to the company in 1957 as manager of engineering.

Also at this time, Robert G. Poetsch has become sales manager. He joined the company in 1952 as a sales engineer.

## Men moving up in the industry

TWO EXECUTIVE personnel changes have been announced by Miles Cary, vice-president of the Virginia Electric and Power Co.

Thomas S. Martin, Jr., superintendent of system operation, Power Dept., has been appointed manager of system planning in the Engineering and Construction Dept., replacing George M. Tatum, deceased.

Replacing Mr. Martin is Eugene B. Crutchfield, former company operating engineer in the Power Dept.

Mr. Martin joined Vepco in 1928, and was appointed superintendent of system operations in 1955.

* * *

THE PROMOTION of Gordon Cavanagh to the position of product manager for Alumoweld, the new aluminum-covered steel wire and strand made by the Wire and Steel Div., Copperweld Steel Co., has been announced by F. E. Leib, vice-president of the division.

Mr. Cavanagh will continue to be located at the Division's headquarters at Glassport, Pa., where he was development engineer. Prior to moving to Glassport he was a sales engineer for Copperweld covering the states of Indiana and Michigan.

After receiving his B. S. degree in Electrical Engineering from Washington University at St. Louis, Mr. Cavanagh was employed by electric utilities in Illinois, Missouri, and Iowa before joining Copperweld in 1952.

* * *

APPOINTMENT of Kirk M. Reid as manager of lighting education for General Electric's Large Lamp Dept., was announced at Nela Park recently by Robert V. Corning, acting marketing manager.

Mr. Reid replaces Willard C. Brown, prominent internationally in lighting and engineering fields, who retired recently.

In his new capacity, Mr. Reid will be responsible for the operation of

**Kirk M. Reid**

the world-famous Lighting Institute at Nela Park, and for lighting education programs.

Mr. Reid joined G.E. in 1920 after receiving a degree in Electrical Engineering from Cornell University. He is a Fellow of the Illuminating Engineering Society.

Mr. Brown, retiring manager, is currently president of the United States Committee of the International Commission on Illumination, and is scheduled to head the U. S. delegation to the Congress on Lighting at Vienna, Austria, in 1963.

* * *

TWO NEW PROMOTIONS in vice-president positions have been announced by the I-T-E Circuit Breaker Co.

Harry L. Buck, formerly vice-president and general manager, has been elected to the newly created post of executive vice-president by the board of directors of I-T-E Circuit Breaker Co., Philadelphia.

At the same time, A. E. Mackenzie, previously vice-president and general manager of I-T-E's Kelman Power Circuit Breaker Div., Los Angeles, Calif., was elected to the newly established position of vice-president, power equipment.

Mr. Buck has been with I-T-E for 25 years, serving as treasurer for nine

FOR OUTDOOR DUTY!

Don't let the styling of STONCO's new "Award Series" fool you. These are outdoor bullets. Solid cast aluminum. Completely weatherproof. "Air-conditioned" for cooler, cleaner operation. The only truly decorative floodlights designed specifically for any outdoor application.

**A COMPLETE LINE FOR 75W-300W REFLECTOR LAMPS** Single or cluster fixtures in 3 distinctive styles, wide range of finishes. For ceilings, walls, under eaves . . . all exteriors requiring a high-degree of architectural and color fidelity.

- The Award Series is now on display at your STONCO distributor. Look for it.
- Write today for Award Series catalog: Section A-78.
- See Sweet's Architectural file: 33a/ST.

STONCO Award Series

CLUSTER LIGHTS • POWER BEAMS
VAPORTIGHT • BOXES AND FITTINGS
EMERGENCY PORTABLES

©STONCO ELECTRIC PRODUCTS CO.
KENILWORTH, NEW JERSEY

**Harry L. Buck**

years before he was named vice-president and general manager in 1955. He is a director of the firm and two of its Canadian subsidiaries, Eastern Power Devices, Ltd., Port Credit, Ontario, and Canadian Porcelain Co., Ltd., Hamilton Ontario.

Mr. Mackenzie has been with I-T-E since 1944, having served as Kelman Division vice-president and general manager since its acquisition by I-T-E in 1956.

* * *

ANACONDA Wire & Cable Company announces the appointment of Austin W. Dunham as manager of utility sales, with headquarters at 25 Broadway, New York, N. Y.

Mr. Dunham joined Anaconda in 1932. He has successively held the position of district manager at the company's Denver, Cleveland and Detroit sales offices.

**Austin W. Dunham**

THE APPOINTMENT of Donald D. Scarff as general manager of the General Electric Company's Large Lamp Department has been announced by Herman L. Weiss, general manager of the Lamp Division at Nela Park.

Mr. Scarff, formerly Western Region sales manager of the Large Lamp Dept., replaces Mr. Weiss who has been serving as acting general manager of the department since December 14, 1959.

Following graduation from M.I.T., Mr. Scarff joined General Electric in 1941 as a student engineer attached to the Engineering Department of the Apparatus Division at Schenectady, N. Y. He became manager of the Western Sales Region of five Large Lamp Department Sales Districts in 1957, remaining in this post until his present assignment.

* * *

THE APPOINTMENT of Charles R. Billman as general manager of the National Electric Division of the H. K. Porter Co., Inc. was announced recently by the company's president, C. L. Holbert.

Mr. Billman, has been most recently assistant to the president of Porter, with special assignments including new plant construction, acquisitions, distribution and general management.

* * *

HOWARD A. FREY has been appointed general manager of the Insulator Dept., General Electric Co., Baltimore, Md. Mr. Frey joined the Insulator

**Howard A. Frey**

Department in 1926 and served in various engineering capacities until his appointment in 1950 as manager of engineering.

* * *

I-T-E CIRCUIT BREAKER Co., Philadelphia, has appointed C. E. Wood district manager of its Miami sales office. Wood succeeds Lee Hamilton, who has resigned.

Wood joined I-T-E in 1953 as a

**C. E. Wood**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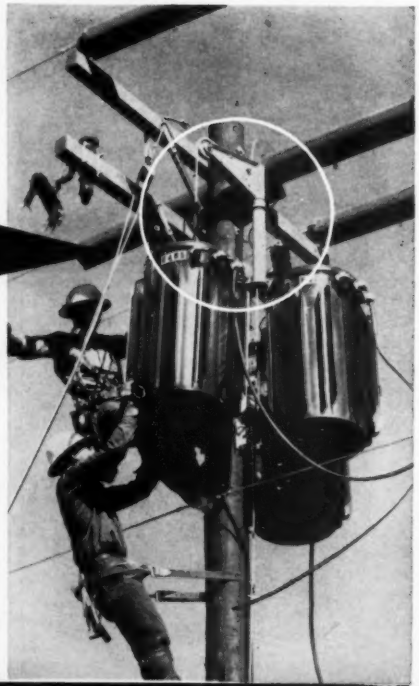

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sales representative for the company's resale line in the Philadelphia district office. In 1957, he became head of the Philadelphia district office Resale Market group.

* * *

JOHN METELNICK was recently appointed general manager of Garcy Lighting, division of Garden City Plating and Manufacturing Co., 2475 Elston Ave., Chicago, by C. K. Kurtzon, president.

Mr. Metelnick joined Garden City in 1947 as a member of their Canadian sales force. In 1959 he joined the parent company in Chicago as Midwest regional sales manager, and later became marketing manager.

## Manufacturers appoint new representatives

PFAFF & KENDALL, Newark, N. J., announces the appointment of B. E. Watson & Associates as representatives for Northern Texas and Oklahoma. The Watson organization

**B. E. Watson**

maintains headquarters at Dallas and will service the territory for the P & K line of aluminum standards for street, and highway and area lighting.

* * *

THE WAKEFIELD CO., manufacturers of commercial and industrial lighting equipment and luminous ceilings has appointed two new Southern sales representatives, Robert M. Brown, regional sales manager announced recently. Richard Marshall will cover the Charlotte, N. C., area, while Walter Jerkins will be assigned to the Jacksonville, Fla., section.

* * *

TWO NEW SALES department appointments have been announced by R T & E Corp., Waukesha, Wis., and Portland, Ore., Loren D. Barre, marketing director reports.

Raymond J. Johnson, formerly R T & E sales engineer and advertising and sales promotion manager, has been named district representative for Missouri and Illinois. He will be headquartered in St. Louis.

The Charles W. Ashby Co., Birmingham, Ala., has been named to represent the full R T & E distribution transformer and protective equipment line in Alabama and parts of Florida.

* * *

BILL CRICHTON, president of Bill Crichton & Assoc., Riverview, Fla., recently announced the addition of three associates in the state of Florida.

C. R. (Charlie) Stegin, 2321 Riverside Ave., Jacksonville, Fla., will be in charge of sales in the Jacksonville trading area. At the same time, C. R. (Curtis) Maddox, 5601 Suwannee Ave., Tampa, Fla., will supervise sales in the Tampa trading area. J. R. (Heinie) Heidenreich, 1628 N. E. Sixth Court, Ft. Lauderdale, Fla., will be in charge of sales in the Miami trading section.

Among the companies now represented by Bill Crichton & Associates are: Pittsburgh Standard Conduit Co., Feedrail Corp., M. Stephens Mfg. Co., Atlantic Transformer Co., Interlectric Corp., and Accurate Mfg. Co.

* * *

ROGER E. BESSMER, 3304 Norton Ave., Independence Mo., has meen appointed by the Edwin F. Guth Co., St. Louis, Mo., as their new lighting representative for Western Missouri and Northern Kansas. Mr. Bessmer has had more than five years experience as a lighting manufacturer's representative and has actively assisted in designing fixtures.

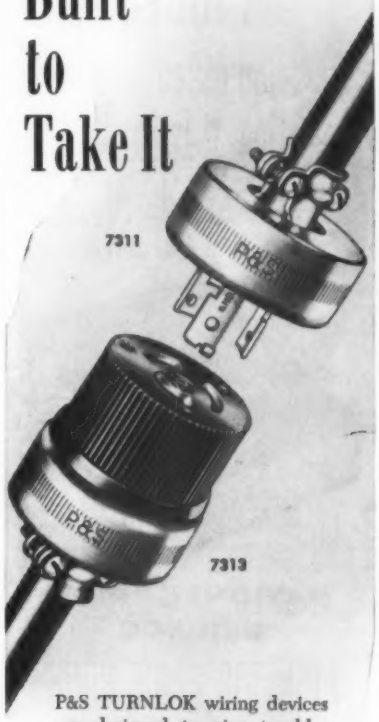
* * *

VERLYN H. BRANHAM & SON, manufacturers' representatives, 1053 W. Peachtree St., N.E., Atlanta, Ga., have been named Southern agents by Tork Time Controls, Inc. Mr. Branham, Sr., was formerly in the electrical business. He opened his own representative agency in 1945. His son has been a partner since 1950.

**V. H. Branham, Sr. and Jr.**


P&S TURNLOK

Built to Take It




P&S TURNLOK wiring devices are designed to give trouble-free service no matter how tough the going gets. TURNLOK devices are available in 10 and 20 Amperes, 2-, 3-, and 4-wire types: receptacles, connectors and caps.

All P&S TURNLOK devices have extra large head binding screws and ample wireways for quick, easy wiring. Armored sections are anchored securely. Cap blades are positioned accurately. Contacts are anchored securely. Fastening screws in connectors are secured in body . . . cannot fall out in wiring. Ratings are plainly visible.

*For information about P&S TURNLOK Line, write Dept. ES-46*

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CRESCENT Insulated Wire & Cable Co., Trenton, N. J., announces the addition of Jones-Philibert & Co., 358 Suave Road, New Orleans to their list of Southern sales representatives. Jones-Philibert will cover the state of Arkansas as well as that of Louisiana.

# Technical books

***for the electrical man***

## Basic matrix analysis

*"Introduction to Matrix Analysis," by Richard Bellman. Published by McGraw-Hill Book Company, Inc., 327 West 41st St., New York 36, N.Y., 331 pages, $10.00.*

Three basic fields in the analysis of matrices are covered in this newly published book. They are symmetric matrices and quadratic forms, matrices and differential equations, and positive matrices and their use in probability theory and mathematical economics. The book also presents part of the theoretical treatment of the use of matrices in the computational solution of ordinary and partial differential equations by means of digital computers.

Emphasizing the parts of matrix theory that occur in analysis and application, the contents of this book are specifically slanted toward the needs of analysts, statisticians, mathematicians, mathematical physicists, engineers, and mathematical economists. Each part is motivated with a discussion of the mathematical, physical, and economic background of the matrix theory introduced. Important chapters are included on dynamic programming and stochastic matrices.

Many references are given to original research papers containing further results and should enable the reader to make more complete use of current research papers.

## Motor selection

*"Motor Selection and Application," by Charles C. Libby, manager, Electrical Division, Morse and Co. Published by McGraw-Hill Book Company, Inc., 327 West 41st St., New York 36, N. Y., 486 pages, 222 illustrations and 70 tables, $13.50.*

How to effectively select and apply electrical motors for specific industrial services is outlined in this newly published book. It explains motor selection in terms of load characteristics, service requirements, space limitations, duty cycle requirements, and safety.

The author has organized and condensed a wealth of information without involving the reader in advanced mathematics or electrical theory. Motor temperature rise as a key factor in determining motor life is discussed in relation to motor insulation, temperature, and various load cycles including continuous load, intermittent load, and reversing cycles. The book covers load torque characteristics for induction, synchronous, and d-c motors, as well as motor enclosures for all types of industrial motors.

Over 290 charts, tables, and illustrations relate load variables to motor characteristics, and enable the user to achieve the most economical, smallest, lightest, and lowest maintenance electrical equipment for the task to be performed. The data presented includes industrially acceptable standards of ASA, AIEE, and NEMA which apply specifically to integral-horsepower polyphase motors and to d-c motors.

## Audio designs

*"Audio Designers Handbook," by the Amperex Applications Engineering Laboratory. Published by Amperex Electronic Corp., Hicksville, Long Island, N. Y., 33 pages, $1.50.*

Containing comprehensive audio design information and an up-to-date collection of amplifier circuits for use by design engineers and advanced audiophiles, this handbook features the first appearance in print of a newly developed, high gain, phase splitter circuit, and a low voltage, high current output stage.

The handbook contains treatments of over-all requirements of monophonic and stereophonic systems, features of the ideal amplifier, amplifier performance criteria, the output stage, phase splitter stage, voltage amplifier stage, pre-amplifier stage and power supply.

Fourteen full pages of complete schematics of monophonic and stereophonic preamplifiers and amplifiers illustrate the range of design possibilities available today to the equipment designer. They also indicate how the design engineer may utilize most effectively the broad range of Amperex audio tubes that are available to him.

Also included in the handbook is a complete tabular listing of Amperex audio tubes. They are conveniently divided according to function and basic specifications are listed for each tube.

# New products

### Explosion proof housing suits wide range of devices

A NEW EXPLOSION PROOF housing for electrical equipment, made by the Adalet Manufacturing Co., 14300 Lorain Ave., Cleveland 11, Ohio, has recently received UL listing.

Cast from aluminum alloy, these explosion proof housings were tested at pressures up to 275,000 pounds force exerted against the cover, for

Underwriters Laboratory listing in Class I, Group D, and Class II, Groups E, F, and G, hazardous locations. In addition these housings will not rust, are non-magnetic, non-sparking, and are light in weight (prox. ⅓ that of cast iron). Flanged surfaces are ground flat to 0.0015-inch, and do not utilize gaskets.

Recommended applications include housings for equipment starters, relays, splices and permanent terminal panels. They are particularly suitable for use with control panels because of their light weight.

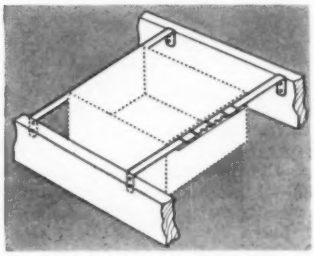
These housings are furnished "blank" from stock in 33 sizes up to 24 inches x 24 inches x 8 inches. Drilling and tapping is normally performed to specifications at the factory.

**Write P-420 on reply card, pg. 17**

### Adjustable bar hangers eliminates joist notching

MARKSTONE Manufacturing Co., 1531 N. Kingsbury St., Chicago 22, Ill., is now manufacturing an exclusive new type of bar hanger that saves time in drywall installation of recessed boxes, or hi-hats, by eliminating the need for notching ceiling joists.

Called "No-Notch" drywall bar hangers the devices are adjustable,



and attach to the sides of joists, instead of on the bottom surface, as with ordinary bar hangers. There is no need to notch joists, since the new hangers are tipped with slotted, "L"-shaped ends that are nailed to the sides of joists. Hangers are instantly adjustable to any joist spacing up to 24-inches by means of a simple slide-clasp, allowing easy lengthening or shortening.

"No-Notch" hangers can be positioned high or low on joist sides, allowing for any proposed thickness of drywall, including any acoustical material that may be used after drywall installation. Work saved by not notching joists reduces installation time, allows leeway for "closer" estimates, especially when figuring cost of multi-fixtured jobs such as residential, stores, offices, or commercial buildings.

**Write P-421 on reply card, pg. 17**

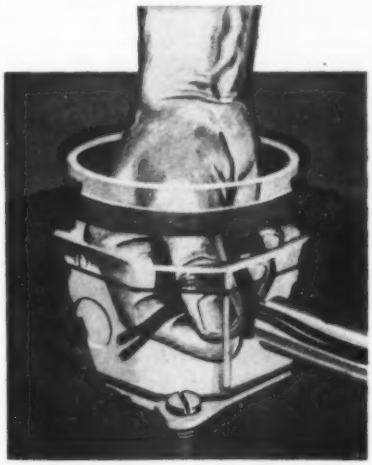
### Motor control centers made up of compact units

MOTOR CONTROL centers with bus capacity from 200 to 2,000 amperes for voltages from 110 to 600 are now available from Allis-Chalmers Manufacturing Co., 938 S. 70th St., Milwaukee 1, Wis. The centers, offering

improved operation, easier maintenance and increased versatility over individual units, are used to control electrical loads such as motors, lighting, welding and heating in industrial plants and commercial buildings.

Available either as fusible or circuit breaker combination units, the


**POUR CONCRETE To Very TOP**



**Still Have PLENTY ROOM to WORK**

The #190 "Tru-Level" steel-bodied, brass-topped adjustable floor box permits pouring of concrete to very top in one operation—Or, to box-body height only, for which a second tin lid is provided.

After concrete is hardened, a full ½" horizontal adjustment is possible.

The box-body has a 3¼" opening—plenty large enough to get hand into for conduit attachment or wire-pulling.

A skin tight plastic collar seals out moisture while protecting adjusting-ring threads. No voids or water pocket can occur with plastic ring fitting tight against surrounding concrete and remaining there.

Listed under re-examination services of Underwriters Laboratories, Inc.

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control centers consist of two or more starters fed from a common bus and are often attached to transformers or switchgear to form a unit substation. Substations can be purchased as a complete package or as individual units. All control compartments of like size are interchangeable anywhere in the control panel.

Control center features include: reduced engineering and installation cost; savings in floor space up to 33 percent; plug-in design which allows units to be easily moved from one location to another; need of only one main circuit breaker for one center; and centralized arrangement of equipment.

**Write P-422 on reply card, pg. 17**

## Thin ceiling heater warms offices, garages, barns

ONE OF THE thinnest ceiling heaters made in America is the new all-radiant C-209, made by Ampere Industries, 60 Boston St., Newark 3, N. J. Only 2 inches deep, the C-209 Zonemaster can be surface mounted on non-combustible ceilings or suspended from standard ceilings. It utilizes the famous Ampere Flat Quartz element for all-radiant output of 91 per cent by certified laboratory tests and requires no fans or reflectors.

This unit is being used extensively

for outside porches, offices, restaurants, industrial plants, garages, food plants, patios, barns, milking parlors and other hard to heat and exposed areas where people work or live. Being all-radiant, it doesn't dry the air, but minimizes movement of air and dust. From 8 to 10 feet, the Ampere C-209 will heat an area of approximately 125 square feet. It is 6 inches wide, 36 inches long, and can be installed between lighting fixtures for decorator effects.

Ratings are C-209—2000 watts; C-209-3—3000 watts; 240 volts with 208 volts or 440 volts available.

**Write P-423 on reply card, pg. 17**

## Dustless concrete drilling reduces cost, noise, time

A FASTER, cleaner, lower-cost method of dry-drilling reinforced concrete has been developed by New England Carbide Tool Co., Inc., 55 Commercial St., Medford 55, Mass. This new "Method A" is ideal for use in areas where dust and noise would be prohibitive, such as in hospitals, hotels, offices, institutions, food-processing and industrial plants.

The new method incorporates New England Carbide's Cyclo-core bits, dust exhaust swivel, power unit, and dust collector. A powerful vacuum sucks dust and steel cuttings from the hole as they are made, reducing heat, friction, and noise to an absolute minimum. The full power of

the drilling equipment can now be applied to the bit, resulting in a faster rate of penetration and longer bit life. With the faster cutting rate, labor costs are drastically reduced.

The carbide-tipped bits used in "Method A" drilling are among the finest developed, for when steel reinforcing rods are encountered, the carbide easily cuts through them. The Cyclo-core drilling machine used in "Method A" is fully portable, requires no bracing or fastening to walls or floors, and can be adapted readily to any drilling problem. Only one operator is needed to operate the machine, from start to finish.

**Write P-424 on reply card, pg. 17**

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Straight tearing
High tensile strength
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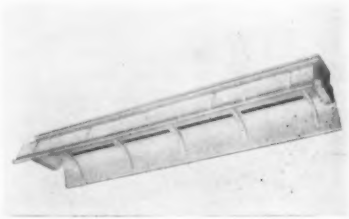
## Industrial luminaire features new strength

AN EXCEPTIONALLY strong and rigid new industrial fluorescent lighting fixture, the "Mark V Industro-lux" contoured reflector luminaire, has



just been introduced by Smoot-Holman Co., P. O. Box 4097, Inglewood, Calif. It is designed to RLM standards.

The secret of the new Mark V Industro-lux fixture lies in the ribbed construction of the reflector. It has five heavy die-formed ribs every 48 inches. When hung in continuous rows, the uniformity of the reflectors assures straight, even rows. Of course the fixture can also be hung individually. A wide selection of mounting accessories of the gripper type is available.

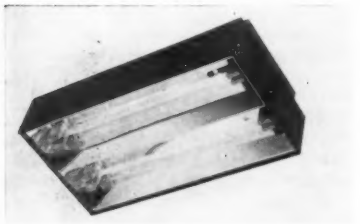
The new reflector has an all white porcelain finish. The reflectance is over 85%. Other metal parts are protected by a five stage rust inhibiting treatment before finishing with baked white Permalux. A rotating spring-loaded reflector latch makes possible fast removal for cleaning. Stirrup holds reflector securely, releases instantly with a quarter turn.

**Write P-425 on reply card, pg. 17**

## Infrared lamps supply area heating indoors or outdoors

DEVELOPMENT of new infrared heating units especially designed to make reflected radiant heating practical for almost all indoor and outdoor, open-area applications has been announced by Luminator, Inc., 120 N. Peoria St., Chicago 7, Ill.

The new Luminator infrared heating units are designed with highly efficient reflectors for use with General Electric T-3 Tubular Quartz infrared lamps having filament temperatures in excess of 4,000°F. These



infrared lamps convert approximately 85 percent of their energy into radiant heat similar to that of the sun. The Luminator units then project this heat into specific areas in the same manner that light is projected, to instantly warm people and surfaces directly. The warmth projected can be compared to that of the sun's rays felt by someone stepping from the shade into sunlight on a cool day.

Luminator infrared heating units are particularly suited for use in such high-bay buildings as aircraft hangars, maintenance shops, and warehouses, where they can be installed to economically project heat only to specific work areas where warmth is required. A few of the many outdoor applications for infrared controlled heat are loading platforms, grandstands, and drive-in-restaurants. Regardless of surrounding temperatures, anyone stepping within the projection area of the unit immediately feels comfortably warm.

According to Luminator, operating costs for their units are comparable to and often less than gas, coal, and oil heating costs for open-area applications where overall warmth is not necessary.

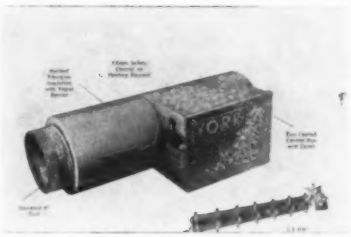
**Write P-426 on reply card, pg. 17**

## Duct heaters work with air-conditioning units

A NEW ALL-ELECTRIC duct heating system for use in residences in connection with a central air conditioning unit has been announced by the York Division of Borg-Warner Corp., York, Penn.

The heating system consists of electric duct heating units installed directly in the air distribution system using the air moving equipment of a self-contained or remote air conditioner for the distribution of the heated air.

The use of individual room duct heaters located immediately before the outlet diffuser in the room, and controlled in the room by a separate thermostat, allows for complete flexibility in meeting individual heating



requirements and minimizes operating cost.

Another feature of the new system is a tempering heater located in the main duct at the fan outlet to take the chill out of the air going to spaces where there is no call for additional heating. An interlocking relay is included in the assembly to prevent operation of the tempering heaters while the cooling unit is in operation.

**Write P-427 on reply card, pg. 17**

## Slotted angle steel framing has interchangeable sizes

STEEL CITY Electric Co., 1207 Columbus Ave., Pittsburgh 33, Penn., is marketing a completely new line of slotted angle steel framing for the suspension and structural support of electrical installations. The new line is called the "right angle method."

The new Steel City right angle line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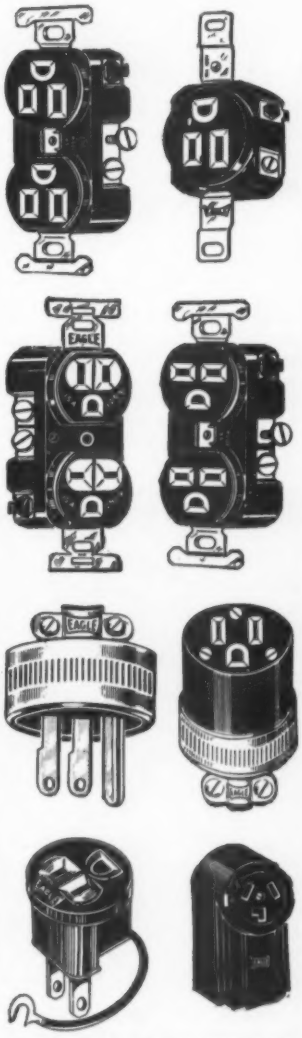
EITHER WAY IT DOESN'T MAKE SENSE

EAGLE

AVOID CALLBACKS
SPECIFY APPROVED
AND PROVED
WIRING DEVICES



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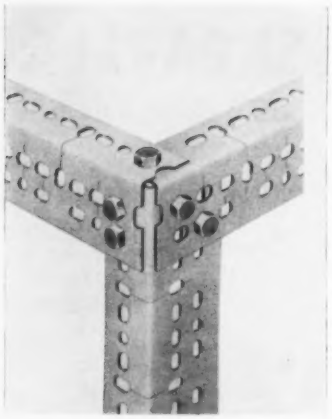
LONG ISLAND CITY 1, NEW YORK



is made of structural quality steel, with a brightened, extra thick electro-galvanized finish. Its attractive corrosion-resistant finish permits immediate installation without regard for additional painting, although it provides an excellent bonding surface for paint if desired.

The three types of the new Steel City right angle line are Type Number RA 150, size 1⅜ x 1⅜ inches of .067-inch thickness; Type RA 225, size 2⅜ x 1⅝ inches of .080 thickness; and Type RA 300, size 3⅛ x 1⅝ inches of .104 thickness. Each type has measure and cut marks spaced at ¾-inch intervals, with a special mark at 3-inch intervals.

The Steel City right angle method is designed for interchangeable application in all sizes within the same structure and with other makes of slotted angles. A single portable cutting instrument with centering pin for exact cutting mark alignment is available and adapted to all three sizes of slotted angles. The cutter features a fixed locating pin for cutting at 3-inch marks and an exclusive movable pin for cutting at ¾-inch measurements.

**Write P-428 on reply card, pg. 17**

## Electric boiler suited to hot water heating systems

AN ELECTRIC hot water heating boiler built by Precision Parts Corp., 400 North First St., Nashville 7, Tenn., is designed for radiant panel, convector, baseboard, and radiator type heating systems. Coal, oil, or gas-fired hot water systems can be converted easily and economically.

The hot water heating boiler supplies hot water at temperatures ranging from 60 to 250 degrees, and is suited for new or old homes, motels, churches, commercial buildings, and swimming pools. This unit can also be used with a water chiller for year-round air conditioning.

The new boiler is available in sizes from 40,948 Btu to 2,047,200 Btu. Space required for the 40,948 Btu size is 20 by 24 by 36 inches, while the area needed for the 2,047,200 Btu size is 60 by 108 by 70 inches.

The units meet the requirements of the ASME Boiler and Pressure Vessel code.

**Write P-429 on reply card, pg. 17**

## Ducted range hood suited for use with long ducts

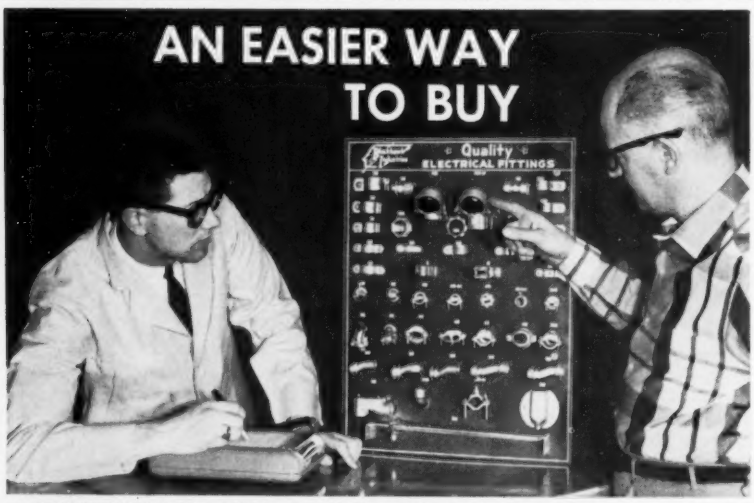
ONE OF THE FIRST Mixed-Flo ventilating fans used with a ducted range hood is being introduced by the Broan Manufacturing Co., P. O. Box 140, Hartford, Wis. The unit will be incorporated in a new package hood called the Broan Mixed-Flo Hood.

Principal feature of this compact, economical ventilating system is the extra power it provides for long duct runs and elbows, formerly achieved only by more expensive blower units or larger more costly fan powered systems. The manufacturer claims exceptional low sound level performance because of the high operating efficiency of the fan.

Because the Mixed-Flo Hood is fully unitized, the fan being housed completely within the hood, only the exhaust duct requires cabinet space. The hood offers vertical or horizontal discharge through a standard duct. And being a complete package unit, factory wired, installation time is reduced to the very minimum.

The hood features contour-corner design, permitting adjacent cabinet doors to open fully. There are no rivets or trim strips.

**Write P-430 on reply card, pg. 17**

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You save time and make certain of getting just the items you want when you order by number from this convenient display board. See and feel Blackhawk quality.

Simplify your purchasing, keep your inventory under control with this convenient new BLACKHAWK display board.

Look for it at your electrical distributors . . . and order the fittings that save you time, build a reputation for quality service.

Blackhawk Industries DUBUQUE, IOWA

*where the new ideas come from*

# Helpful literature

***available to our readers***

Literature describing insulated clevises has just been published by **Porcelain Products Co.,** 225 N. Patterson St., Carey, Ohio, manufacturers of insulators and electrical supplies. The new flier lists complete specifications for all **clevises** including swinging and standard. Porcelain Products clevises are designed for dead-ending service drops at either end and for general use in commercial and industrial service.

**Write B-431 on reply card, pg. 17**

**Jay Lighting Mfg. Co., Inc.,** 25 Quincy St., Brooklyn 38, N. Y., has just issued Supplement 60A, a colorful presentation of 54 of the most recent additions to the Jaycandescent line of **ceiling and wall fixture** originals for homé and commercial use.

**Write B-432 on reply card, pg. 17**

Improved readability and added product information are features of the new 1960 Speedfax Catalog just published by **I-T-E Circuit Breaker Co.,** 1900 Hamilton St., Philadelphia 30, Pa.

The comprehensive 60-page illustrated catalog provides information on I-T-E's standard and engineered products in fast-reference form to aid in selecting equipment for industrial plant and commercial building **electrical distribution systems.**

**Write B-433 on reply card, pg. 17**

A twelve-page application bulletin, titled **"Practical Hi-Pot Testing"** is offered by **Associated Research, Inc.,** 3777 W. Belmont Ave., Chicago 18, Ill. Separate sections cover a-c and d-c breakdown testing, with discussion on non-destructive tests of dielectric strength in wiring harnesses, motors, cables, solenoids, thermostats, and similar equipment.

**Write B-434 on reply card, pg. 17**

A new 16-page catalog for cast-aluminum explosion-proof housings is now offered by the **Adalet Manufacturing Co.,** 14300 Lorain Ave., Cleveland 11, Ohio. The catalog presents illustrated design information on the complete line of Adalet **cast-aluminum housing** for explosion-proof and weather-proof applications.

**Write B-435 on reply card, pg. 17**

Handy spiral bound daily appointment calendars with an **electrical reference table** section are now available through the **Hatfield Wire and Cable,** Division of Continental Copper & Steel Industries, Inc., 487 Hillside Ave., Hillside 5, N. J. Printed on heavy stock the desk-size calendar provides room for day-to-day appointments plus tables of information on motor loads, conduit, copper conductors, capacities, building wires and power cables, flexible cords and fixture wires, and electrical events of 1960.

**Write B-436 on reply card, pg. 17**

"Current Designs in Lighting" is the title of the new, 104 page catalog covering built-in **lighting fixtures** by **The Kirlin Co.,** 3435 E. Jefferson Ave., Detroit 7, Mich. The book contains installation information, lighting curves and other technical data; also for each fixture there is a "Rapid Estimate Chart" to determine quickly the apporximate lighting intensity from a proposed lighting layout.

**Write B-437 on reply card, pg. 17**

Bulletin SPM-1-1159, featuring Autocon Plan-Pak **motor control centers** is now available from the **Automatic Control Co.,** 995 University Ave., St. Paul 4, Minn. Plan-Paks featuring the modular draw-out uni-cell arrangement, the modular fixed mounted uni-cell system, and the economy panel-mounted motor control are all discussed in the brochure. Illustrated construction details, plus methods of figuring them are included.

**Write B-438 on reply card, pg. 17**

Redi-Reference, a 155-page condensed catalog describing the more than 2,500 products in the line of **electrical control,** distribution and power equipment manufactured by **Federal Pacific Electric Co.,** 50 Paris St., Newark 1, N. J., has been issued by the company. It comes complete with photographs, tables of specifications, pricing information, and wiring diagrams.

**Write B-439 on reply card, pg. 17**

Illustrated with both product and application pictures, and containing up-to-date products and price information, new Catalog No. 34 has just been made available by **Insulation Manufacturers Corp.,** Publications Dept., 565 West Washington Blvd., Chicago 6, Ill.

This completely indexed 36-page catalog covers **electrical insulations** for all electrical uses.

**Write B-440 on reply card, pg. 17**

A newly published brochure describing improvements made in rubber jacketed Bronco 40 **portable electrical cord** has been released by the **Western Insulater Wire Co.,** 2425

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East 30th St., Los Angeles 58, Calif. The brochure includes two types of the new cord, which features electrically annealed copper and specially lubricated insulation for better flexibility.

**Write B-441 on reply card, pg. 17**

The **Continental Electric Equipment Co.,** 205 W. Fourth St., Cincinnati 2, Ohio, has just published a catalog of current prices titled the Continental Easy Estimator. The 300 page, illustrated catalog digest contains prices and specifications of the entire Continental line of **distribution equipment** including recent additions in the form of safety switches and draw-out medium voltage switch gear.

**Write B-442 on reply card, pg. 17**

Three simple-to-use **spotlights** for use in stores, churches, schools, or other such areas are described in detail in a six-page folder from the **Amplex Corp.,** 214 Glen Cove Rd., Carle Place, L. I., N. Y. The spotlights are especially suited to colored or white highlighting effects on any indoor area. "Spill light" is held to a minimum, and three sizes allow better selection for each need.

**Write B-443 on reply card, pg. 17**

**Edwin L. Wiegand Co.,** 7500 Thomas Blvd., Pittsburgh 8, Pa., offers a colorful new four page Bulletin F00102 describing the benefits and economic advantages of **heating churches electrically.** Offered by the manufacturer of Chromalox electric heating equipment, this bulletin applies not only to new construction but also to new additions and conversion of existing structures to electric heat.

**Write B-444 on reply card, pg. 17**

"Standby Electric Plants and Controls, a Guide to their Selection and Installation", is the title of an eight-page folder offered by **D. W. Onan & Sons Inc.,** Minneapolis 14, Minn. Designed for all who have a need for **emergency electric power,** this authoritative bulletin is the official Onan insert in the 1960 Sweet's Architectural File. Beginning with the need for standby power, Onan's new folder outlines clearly the steps to be considered in the selection of any emergency electric generating plant.

**Write B-445 on reply card, pg. 17**

**Edwin L. Wiegand Co.,** 7500 Thomas Blvd., Pittsburgh 8, Pa., offers a new bulletin L-1251 describing and illustrating the many uses of the commercial grade Chromalox Electric Cabinet Convector Heater. These rugged **convection heaters** are ideally suited for wall mounting in entrance ways, lobbies, offices, and hospital rooms. Available for surface or recessed mounting, they come with optional built-in thermostat and day-night relay.

**Write B-446 on reply card, pg. 17**

The **Pyle-National Co.,** 1334 N. Kostner Ave., Chicago, Ill., announces the availability of a colorful product Bulletin No. 652 describing the design, materials, and reliability features of a new complete line of industrial **vaportight lighting fixtures.** Details give labor saving features, technical data, catalog numbers and prices.

**Write B-447 on reply card, pg. 17**

A new 12-page brochure describing an advanced **supervisory control system** is now available from the Ascop Division of **Electro-Mechanical Research, Inc.,** P. O. Box 44, Princeton, N. J. The brochure outlines the features of Ascop's new supervisory control, describes its operation, and shows detailed operating sequences for the various types of control and supervision which can be specified.

**Write B-448 on reply card, pg. 17**

**Hub Electric Company, Inc.,** 2249 W. Grand Ave., Chicago 12, Ill., a pioneer in the fields of **special lighting** and control equipment, announces the recent publication of a unique piece of technical literature, catalog #101, "Engineered Lighting and Control Equipment". This 44-page publication is a comprehensive presentation and includes specification, photometric data, circuiting and dimensional information. The line includes stage lighting equipment, step and night lights, flush and surface luminous elements, exit and directional signs, hospital bedlights, test cell units, downlights, control switchboards.

**Write B-449 on reply card, pg. 17**

Handy new Catalogs, just issued by **Stonco Electric Products Co.,** 333 Monroe Ave., Kenilworth, N. J., condenses a good general cross-section of their complete line of cast aluminum **outdoor floodlights** into eight pages. Included are illustrations, specifications and dimensional drawings on new decorative outdoor bullets, medium and mogul base floodlights, high-intensity Power-Beams, emergency portables, wiring troughs, splice boxes and outdoor fittings.

**Write B-450 on reply card, pg. 17**

A complete guide for modern **service station lighting** has just been published by **Revere Electric Manufacturing Co.,** 7420 Lehigh Ave., Chicago 48, Ill. It catalogs the entire line of matched components, lighting fixtures, poles and accessories, specially designed by Revere for service station lighting applications. The 56-page book, organized for quick and easy reference, has hundreds of photographs and drawings illustrating


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products, components, and installation methods. It includes all information necessary for planning and ordering a complete lighting installation for a modern service station.

**Write B-451 on reply card, pg. 17**

"Compresto Spaced Aerial Cables," a 32 page booklet from **Southern Electrical Co.**, P. O. Box 989, Chattanooga, Tenn., explains how the ultimate in a compact spaced **aerial cable system** can be achieved by combining Compresto cables with PLM's new "Wrap Around" spacers.

**Write B-452 on reply card, pg. 17**

## Code questions

*(Continued from page 109)*

possibility is sufficiently remote to permit the use of such devices under these conditions.

The danger in such an installation is in its *misuse*. I think most people would agree that the chain of events described is not likely to occur. But you realize, as an experienced contractor, that such "overcurrent devices" can be, and probably will be, used as switching controls. It is on these grounds that some inspectors reject such installations. And if you, in good conscience, cannot make such an installation, you are to be commended for having a standard higher than the minimum requirements of the Code.

## Switching device

*(Continued from page 84)*

splitting, line dropping, cable switching, and capacitor bank switching. The major classifications are further subdivided by type of circuit connection and system grounding.

### "Brain" controls sequencing

Heart of Circuit-Switcher is an interrupting unit capable of carrying current continuously and withstanding short-time surges, combined with a "brain" mechanism that gives built-in operating sequence control. In this way, it differs from a load interrupter switch where the disconnect is dominant and the interrupting unit is an accessory.

Mr. Conrad explained that this approach was taken to meet critical requirements at higher system voltages, including problems of optimum performance under icing, effective closing action on faults and inrush currents, and high-speed interrupting action independent of operator speed.

To combine both continuous-current-carrying capability and high-speed circuit interruption in the interrupting unit, two movable contact rods working in parallel are used. One rod is massive to carry load. The other rod is light for high-speed travel. The slower, load-carrying rod is triggered first. The fast, interrupting rod follows. No arcing takes place across the load-carrying contacts. This sequencing and the driving power come from the "brain" mechanism.

## Heat dissipation

*(Continued from page 78)*

with which the desired values are determined.

The lower part of the equation resolves itself into

$$\text{Log}_{10}\left[\frac{0.73179}{0.59036 \times 2.7949} + 1\right]$$
$$= \log_{10} 1.4435 = 0.159417.$$

$$\text{Log}_e = 1.20101 \times 0.159417$$
$$= 0.19146.$$

$$w_e = \frac{0.06104}{0.19146} = 0.31884$$
watts per sq. in.

$w_r$ (line 9) $= 0.10957$
watts per sq. in.

$w = (w_e + w_r) = 0.42841$
watts per sq. in. total.

The heat given off in watts per square inch of conductor surface for most standard sizes of copper wire and cable, #8 and larger, are plotted against temperature rise above still air of 25 degrees C. in Figs 2, 3 and 4. From this set of curves it is readily discernible that unit heat dissipation is reduced as the conductors become larger. Since the heat given off by radiation is independent of conductor diameter, the variation of unit heat dissipation, with change in conductor diameter, is from convected heat only. Convected heat $w_e$ varies from about 83% of ($w_e + w_r$) for #8 copper down to about 67% for 2,000 mcm copper cable.

## Tower design

*(Continued from page 71)*

Not content with the series of development and full scale proof tests that they had already carried out, Alcan engineers concluded their test program by removing one of the guys from one of the four towers already installed in the Chute-Des-Passes lines. A line

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from a tractor winch was attached to the crossarm on the other side on the tower exerting a pull of 2,400 pounds. This moved the top of the tower about one foot offering vivid proof of the inherent stability of the structure.

Aluminium Limited Sales, Inc., American sales subsidiary of Aluminium Limited, predicts a lively interest in the new Alcan Guyed Tower design for transmission line construction in the United States.

## NAED Meeting

*(Continued from page 44)*

have the opportunity to attend the rodeo. Plans have also been made to have square dance exhibitions on the outside of the arena preceding the rodeo, and performances by the Mesquite High School Band.

Most of the convention visitors are expected to arrive April 30, the first day of registration. A number of NAED committee meetings are scheduled for that day at the Memorial Auditorium.

The conference booth center opens on Sunday, May 1, from 2 to 5 p.m. at the auditorium. The center will also be open on Monday and Tuesday afternoons from 1 to 4 p.m. General sessions for the convention will be held Monday and Tuesday mornings from 9:30 until noon. Wednesday morning's meeting in the auditorium will be for NAED members only.

An invitation to all Shriners arriving for the convention on April 30 was extended by potentate John McKee, of Hella Temple, to join in the Spring Ceremonial activities on that date.

"Each Noble of the Order of the Mystic Shrine is invited to join in our Spring Ceremonial which will be held on April 30. Several thousand Shriners will take part in a huge downtown parade beginning at 2:30 p.m., and a buffet dinner and entertainment is planned at Fair Park beginning at 6 p.m.," McKee said.

He reminded NAED members who are Shriners to be sure to bring their fez to Dallas and to arrive in time to take part in the colorful ceremonial.

The women's committee in Dallas also has reported that they have a number of interesting activities planned for wives of NAED members during their stay in Dallas.

A musical book review at the Adolphus, world-famous Neiman Marcus style shows, a special tour of Dallas, and a number of ladies' luncheons are only a few of the many events prepared to make the Women's visit to Texas a memorable one.

## Reduced bandwidth

*(Continued from page 75)*

capabilities.

Step-type regulators, Wejman said, when applied to a system, provide improved distribution system voltage control and enable a utility to provide more usable kva on the line and permit increased loading of existing feeders. Increasing these advantages, the company said, can significantly contribute to a utility system's earnings.

## Plastic conduit

*(Continued from page 42)*

stant pounding of trains passing over it. Of course, it also had to be resistant to local soil corrosive action, and competitive with conventional metallic raceways.

Another application has been made by a utility company, Tampa Electric Co., which is using PVC conduits in some of its underground systems for the downtown network.

In all, over 100 applications of PVC rigid conduit have been made in the Florida area alone in the past year, indicating that this new material will fill a distinct need in the South and Southwest, and that increasing use of it may be expected.

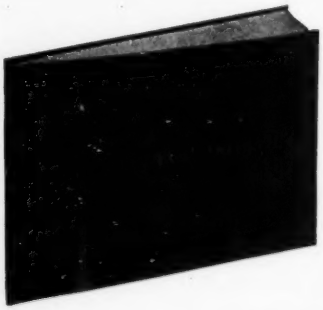
## Remote control

*(Continued from page 40)*

upgrade yourself into the wiring of the more expensive homes."

### Estimating problems

With any low voltage wiring system, the components vary greatly in cost. For example, the relay is more expensive than the average switch. On the other hand, remote control switches cost less than the average line voltage switch. The cost of the outlet box must be considered as part of the line voltage switch, and the cost of the plaster ring must be included

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(April 1960)

in the tally for the remote switch.

As a consequence, estimates for a low voltage system must consider that with added switch points, the cost increases very slightly, while in the ordinary wiring system, as the number of switch points increase, it is accompanied by a great cost boost, considering the high cost of 3-way and 4-way switches. The cost of the added 120 volt cable required is also an important cost factor.

The final cost or profit in a job cannot be too accurately gauged until the contractor has gained sufficient experience with low voltage to insure as much efficiency with its installation, as he possesses in the field of standard electrical construction.

At Sarasota's Cobb Electric Company, veteran contractor Cobb says: "There is no more profit to us in wiring a home with low voltage than we make with conventional wiring, due to the fact that the cost is the same when you figure in the various components required for remote control. This may also be due to the difficulty of accurately figuring the labor cost. In our early ventures in low voltage wiring we got callbacks, and these siphoned away our profit, we're not so much troubled with today's better devices. Mainly our area's salt water and moisture caused parts to corrode, but we were plagued also by people who thought the switches had to stay in, so they taped them down and thus burned out the relays.

"However, if you do enough low voltage work, you get on to every short cut and economy and this makes such wiring jobs more attractive."

Specializing in air conditioning, Cobb gets all heating and air conditioning control through 24 volts on the 2 and 3 horsepower units.

While many contractors estimate a system as a conventional or minimum system, then tack on for the extra circuits and items not included in a minimum wiring system, remote control offers so much more in the way of electrical master control and multi-point switching, pilot light indication, etc., the contractor should consider these factors when upgrading a job or to insure greater estimating accuracy when submitting bids for large housing projects or for elaborate installations that include such controls.

"For example," says Culbreath Whitehead, Jr., Bradenton electrical engineer: "No one denies that the same kind of circuitry can be attained with conventional wiring as is possible in the field of low voltage, but conventional wiring would cost considerably more and the system still wouldn't have the inherent flexibility of low voltage control. The same installation made in conventional fashion requires expensive equipment in the way of switches, contactors, etc. And only with low voltage is it practical, economical and feasible to install master switching.

"For instance, in using high voltage ballasts with 277-volt fluorescents, in order to obtain switching flexibility, the system will wind up with complex switch legs, while the potentially dangerous 277 volts will be at each manually-operated switch.

"On the other hand, a 277-volt rated relay will permit safe low voltage at switch level while isolating the relay and the 277-volt supply up in the fixture or outlet one.

"Again, with one system (Remcon), the contractor can woo a source of income that has long been an electrical orphan—closet lighting. Considering what it costs in labor and materials to install the conventional closet light, it is small wonder that so many pull-chain sockets are seen in closets. Low-voltage control as employed with packaged, pre-wired thermal relay transformer units, enables the installation of a closet light system for a reasonable $6 or $7. It can be wired in like a doorbell and pushbutton; it avoids the presence of high voltage at the button, and makes a practical, economical sales deal for the most modest budget.

"And a surface-mounted switch placed atop a table and wired with a flexible cord to a master control, provides a panic button that can operate a group of lights from a master bedroom."

### Senior citizen prospects

Contractors may well consider that rises in social security and other pensions and increasing longevity are making senior citizens prime prospects for specialty products. By promoting the comfort, safety, and conveniences inherent in low voltage control, with the same vigor they use to market their other services, contractors can realize a good deal of additional business volume, since the number of oldsters who buy the


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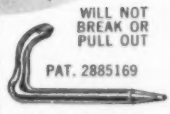


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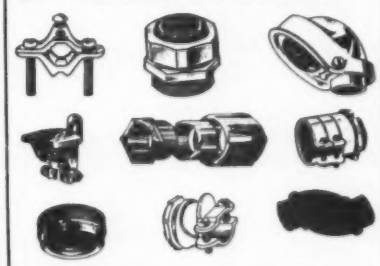

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better homes is on the increase.

Very importantly, financial institutions readily make loans to the elderly for specialty products, and the elders can afford and want extra conveniences in their homes.

One contractor says: "I now do business with home buyers 65 to 70 years old, when not too many years ago their families would have importuned them to cease and desist with the declaration: 'You won't get full enjoyment out of your investment.'

"But the elderly people today are going ahead anyhow, and when an oldster flips a master switch and turns on everything in the house and outside, he's sold!"

Certainly there is evidence that the oldsters are living out their advanced years in their own homes, and sometimes fixing them up lavishly.

Unlike the young married couples, who are usually "bought-up" and heavily in installment debt, the oldsters aren't, thanks to their social security and pension incomes. This makes them logical prospects for a wiring system that assures a "path of light" through the low-cost multiple switching provided by today's low voltage circuitry.

## Office building

*(Continued from page 36)*

by out-of-phase current! Reducing this current will often enable the existing equipment to carry the ever-increasing electrical load for a longer time.

Power factor correction is rarely understood technically by building owners; it must be reduced to savings in operating dollars. We had one specific case where we proposed a capacitor installation costing around $30,000 in one of the larger buildings in Pittsburgh. The local utility company had advised the owner in writing that this installation would save an estimated $8,000 a year in electric bills.

Perhaps, because capacitors have no moving parts and just sit there apparently doin' nothin' and goin' nowhere, the owner just sat on our proposal for months. Finally, we jokingly suggested that we would make the installation and pay the $30,000 if they would give us the annual savings in electric bills for the next five years. They promptly sent a contract based on our original proposal, and we made the installation. The owner is now keenly aware of how this phase of modernization benefited him.

Modernized wiring can also provide operating economies by reducing electrical maintenance costs. We have seen many cases where a man was employed virtually full time just changing fuses, replacing burned up wires, and "shoemakering" extra circuits onto badly overloaded panels to keep the lights on, the window air conditioners operating, and the office machines running in tenant areas.

Not only can a wiring modernization program eliminate the lost time and money caused by the patchwork just mentioned, it will give the owner a planned procedure so his maintenance men can make minor additions and changes to the electrical system properly—in a way that won't jeopardize the new wiring's ability to handle future load increases.

Usually wiring modernization involves renewal of old-style bulky equipment which is mechanically worn out and does not have the electrical capacity to serve present and future loads. Because of the industry trend toward more compact equipment with higher ratings, it is often possible through skillful planning to free substantial areas previously devoted to service equipment, transformers, and switchboards. The owner can then rent this area to tenants or use it for additional storage, shop, or other service functions.

Of course, the opposite can occur with a badly executed modernization program; that is, the building may actually lose rentable area. The point is that modernized wiring can and should free more space and provide the direct benefit of increased dollars income.

### Eliminating hazards

Another major benefit of modernized wiring concerns safety. Often an owner, if he is fortunate, will have this brought to his attention by a local building inspector or insurance man before a fire or serious shock occurs. Fire hazard is normally considered most by the owner because he must pay out dollars for insurance. Two types of fire hazards can be eliminated by modern wiring:

First, is the elimination of what we call "rat's nests"—messes of tangled wire with petrified insulation and antiquated equipment in which technically it is tough to find from where the "juice" comes and to where it goes. If such a rat's nest is touched at all, a short circuit may occur which could start a fire or injure personnel. We have seen and removed these rat's nests from incoming service feeders to branch circuits in the tenant areas.

The second fire hazard which can be removed by modernized wiring is overloading. Old wiring may be in good shape from the

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standpoint of neatness and sound design when it was installed, but it simply cannot carry the present loads put upon it.

Shock hazard is becoming increasingly important with the greater use of office computing machines. In tenant areas, lack of proper grounding on branch circuits and outlets can lead to serious consequences; primarily, by the possibility of lethal shocks from faulty machines, and also from the irritating problem of static electricity often present on machines which sort and process punch cards.

Even in the building service areas, such as maintenance shops, shock hazard can be present because the original building wiring was not designed to assure proper grounding throughout. Only modernized wiring can eliminate this problem in most cases.

We've talked about some of the specific benefits for the owner who modernizes his electrical system. It must be stressed that all of these benefits can only be obtained when a program of modernization is formulated and carried through and then clearly explained to the owner in terms of general capacity and how this capacity of the system matches the estimated load growth.

When the owner has a good understanding of what he has (in the way of total capacity, watts per square foot available for lighting and air conditioning, number of branch circuits per floor) he is then in a better position to intelligently negotiate or renew leases with his tenants. He can truthfully boast his progressiveness and the services he can supply without promising the tenants something which he can furnish only at a sacrificial expense.

In addition, the modernization program gives him a way to control and utilize his maintenance personnel for maximum efficiency and to make periodic adjustments to his electrical system.

## Washington report

*(Continued from page 10)*

population and the growing number of family units; the expected widespread introduction of new types of electrical appliances; and the wider use of already established household appliances such as television sets, air conditioning units, and freezers.

"About 17 per cent of the electric power produced in 1957 was bought by commercial establishments such as stores, office buildings, theaters, and hotels for light, air-conditioning, heat, and sign display. As new equipment such as electric cooking equipment in restaurants, is more universally adopted, it is expected that consumption of electricity will rise. Local, state, and federal agencies and street and interurban railways and electrified railroads which consumed the rest of the electric energy produced in 1957, are also expected to increase their use of electricity in the next decade."

Instrumentation and automatic equipment will greatly reduce the need for additional employees, the Department states.

For more details, read *Occupational Outlook Handbook*, 1959 Edition, (Send $4.25 to the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C.) and the *Manpower Requirements and Training Needs in Construction Occupations*, 1960-1970, put out by the Bureau of Apprenticeship and Training, U.S. Department of Labor, Wash. 25, D. C.

### New council considered for the fossil fuels

THIRTY SENATORS are thinking of setting up a new council one of whose jobs would be research and planning in the field of fossil fuels, hydro-electricity, nuclear fuels, and solar energy.

One reason for establishing a Council of Resources and Conservation Advisors was pointed out by Gordon M. Freeman, president of the IBEW: the United States will consume four times as much electricity in 1979 as it does now.

It will take 735 million tons of


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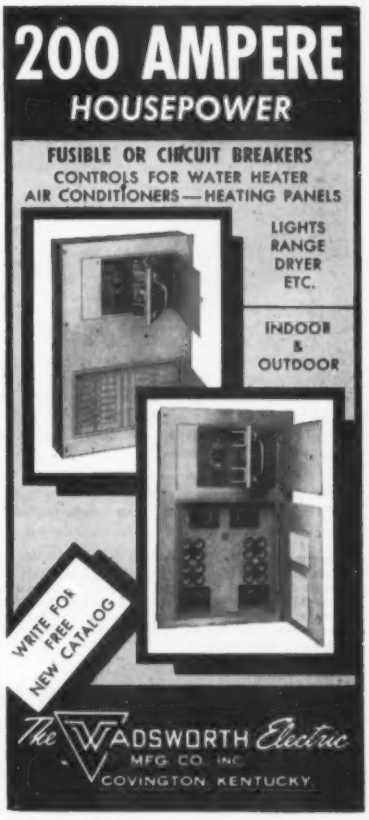


coal, 5.9 billion gallons of oil, and 17.4 trillion cubic feet of natural gas to produce electricity in 1979 alone. The fossil fuels won't last forever, Freeman pointed out. Other sources must be developed.

## Sales training

*(Continued from page 30)*

rectly concerned with the point of sale are involved, their effectiveness is dissipated and the justification of their sales activity becomes moot.

Third, to streamline the sales organization of the electrical industry so as to eliminate duplicating and competing forces aimed at the same objective and concentrate the maximum effort through the logical channel.

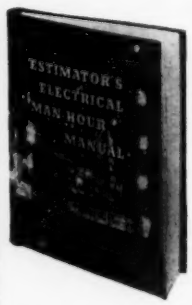
### Basic needs met

Fortunately, NECA has practically all of the tools with which to conduct such a sales training institute. These have been developed in cooperation with other elements in the industry. These include a professionally - prepared course of study in the fields of commercial, industrial, and residential selling. About to be completed is a special course in electric heating, from which could be extracted the sales angles to this growing and important market.

The development of these sales training tools was in full cooperation with our supplier and utility friends. The money that paid for professional preparation of the sales training literature came in part from revenues above actual costs of the National Electrical Expositions and from *Qualified Contractor* advertising. This material was tested in cooperation with our trade allies. It is good.

What we need now is the place and the proper instructors. The funds to finance this training are not considerable and do not bother us too much; at least, at the start. It is our plan that most of the cost be liquidated by tuition paid by the individual enrollees. We have an immediate and imperative need for skilled instructors, and we would like to invite our supplier and utility friends to cooperate in this particular area. NECA policy, approved at the convention in Miami Beach last year, authorizes us to accept assistance in such an endeavor from our trade allies, and for us to participate in such mutual operations.

To propose policies and general guidance for the Institute we suggest the formation of a National Advisory Committee on Contractor Sales Training for the Electrical Industry. Members would be appointed from the national associations representing affected elements of the industry, such as from the National Electrical Manufacturers Association, the National Association of Electrical Distributors, the Edison Electric Institute, the National Appliance & Radio-TV Dealers Association, and NECA. Each of these groups would have one member and an alternate who would attend meetings in event the principal could not be present. This Committee would advise on policies to follow. There would be no financial obligation on the part of any of the associations to support the Institute. Assignment of personnel to the Institute as instructors or other form of support would come from individual companies as they see fit to participate.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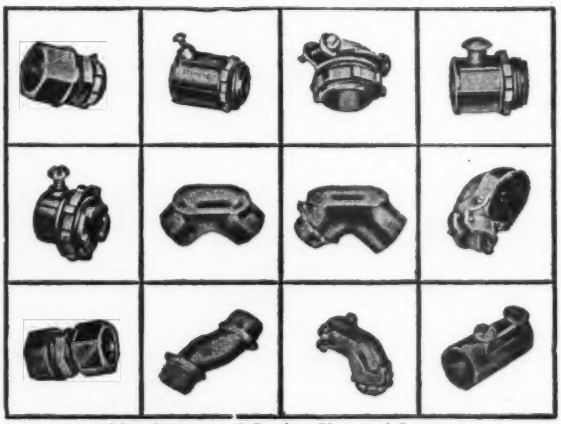

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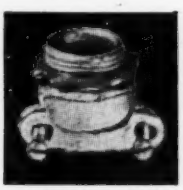

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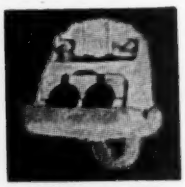

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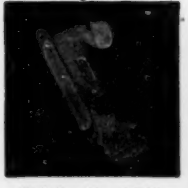

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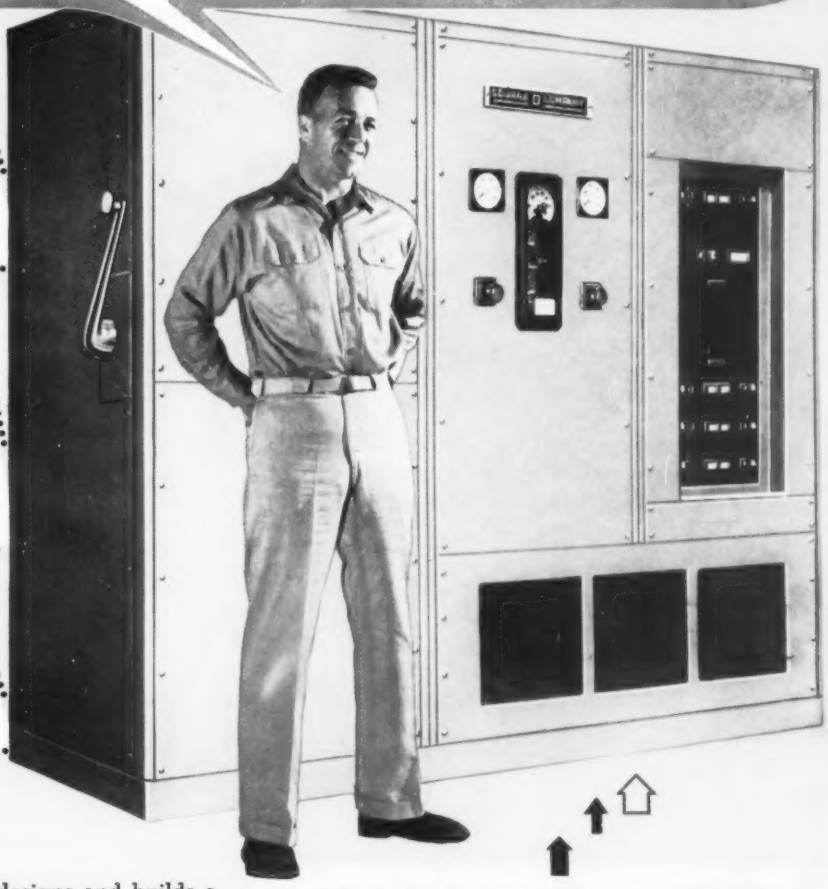

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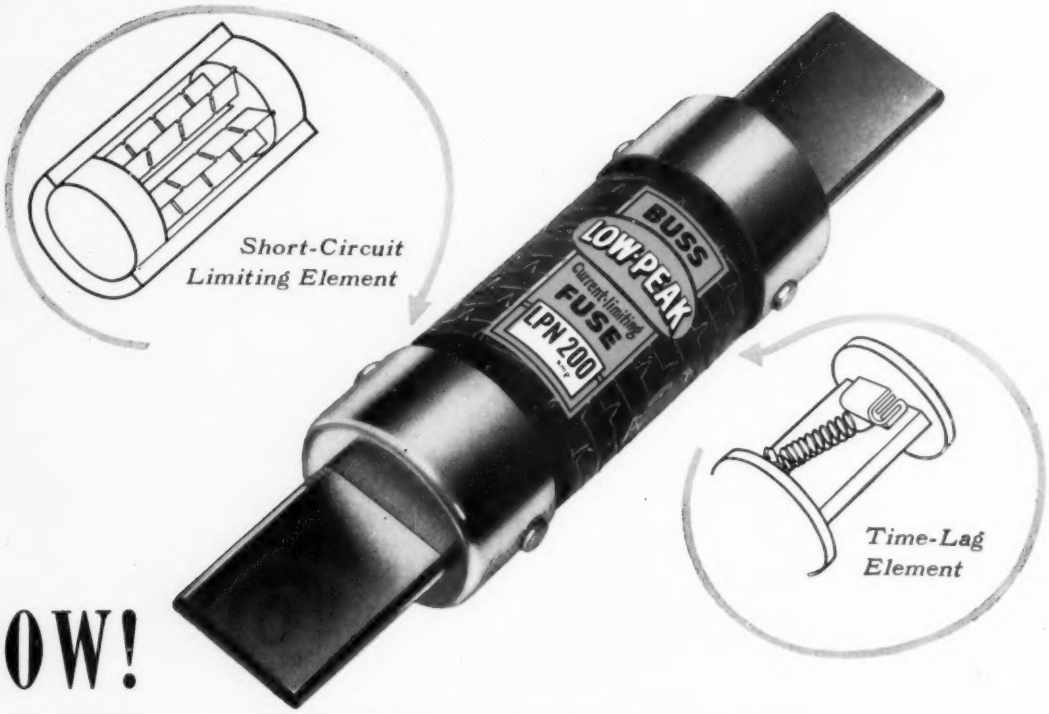


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